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ΡΑΣΤΟΥ
ΤΟΥ ΕΡΕΣΙΟΥ
ΠΕΡΙ ΤΩΝ
ΛΙΘΩΝ
ΒΙΒΛΙΟΝ.

THEOPHRASTUS's
HISTORY OF STONES.

With an English Version, and Notes,
Including the Modern Hiſtory of the Gems deſcribed by
that Author; and of many other of the Native Fossils.

TO WHICH ARE ADDED,
TWO LETTERS:
I. On the Colours of the Sapphire and Turquoise.
II. Upon the Effects of different Menſtruums on Copper.
Both tending to illuſtrate the Doctrine of the Gems being
coloured by Metalline Particles.

The SECOND EDITION;
Enlarged by the Addition of a Greek Index of all the
Words in Theophrastus.
ALSO
OBSERVATIONS on the New SWEDISH ACID,
and of the Stone from which it is obtained;
AND WITH
An IDEA of a Natural and Artificial Method of Fossils.

By Sir JOHN HILL.

LONDON:
Printed for the AUTHOR, in St. James's-Street:
And ſold by L. Davis, in Holborn; Nourse, in the Strand; White, in
Fleet-Street; Cater, in Holborn; Bell, in the Strand; Fletcher,
at Oxford; Woodyer, at Cambridge; and Bell, at Edinburgh.
MDCCLXXIV.

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PREFACE.

THE References to THEOPHRASTUS, and Quotations from him, ſo frequent in the Works of all the later Writers of Foſſils, would make one believe, nothing was more univerſally known, or perfectly underſtood, than the Treatiſe before us: But when we enquire into the Truth, we ſhall find, that though no Author is ſo often quoted, few are ſo little underſtood; or, indeed, have been ſo little read: Thoſe who are free with his Name, having given themſelves little Trouble about his Works, and only taken upon truſt from one another, what was originally quoted from him by *Pliny*. As to that Author, whoever is acquainted with the Works of more antient Writers, muſt know that however much Praiſe he may deſerve for that Treaſure of Knowledge he has collected; yet he is very little to be depended on for the Correctneſs of his Quotations.

It is no Wonder that the genine Work of this Author, on Foſſils, ſhould have been ſo much neglected to be read; ſince whoever ſhall take up the beſt Editions we have at preſent, will find enough in every Page to diſhearten him from making farther Progreſs: The numerous Defects, where whole Words, Parts of Words, and even many Words together are wanting; and the many Sentences, either by the Preſervation of old Errors, or injudicious Corrections of Editors, rendered perfectly unintelligible, will ſoon ſhew, that it is a Work not to be read to any Advantage, without a more than ordinary Attention, a Knowledge of the Subject, and a continual Conſultation of others of the Antients.

In ſuch Condition has this Treatiſe lain; full of excellent Matter, but rendered almoſt unintelligible. The Author is remarkable for uſing very few Words; and where it was common to find ſome of thoſe few wanting, it ſeemed no eaſy Taſk to underſtand him. On this Occaſion, as alſo in regard to the Errors, ſo frequent and perplexing, I have been at the Pains of conſulting the reſt of the Antients; in order to find what it was moſt likely he ſhould ſay, by what they have ſaid on the ſame Occaſion: In theſe Undertakings, *Pliny* alſo, where he could be depended on, has been of ſingular Service; a Paſſage from him, frequently a literal Tranſlation of this Author, ſhewing evidently ly how he had read the Original, who had the Advantage of ſeeing it, at leaſt before the Riſe of many of the Errors that have made it unintelligible to us. This, and examining his Words by, and comparing them with, the Subſtance he is deſcribing, are the two great Methods I have taken to underſtand him.

By theſe Means, and with theſe Aſſiſtances, I have undertaken to give a new Edition of the *Greek* Text; in which whatever may be the Service I have done, I promiſe myſelf I ſhall, at leaſt, be liable to no Cenſure; ſince tho' I have filled up all the Defects, and amended the Errors, ſo as to make the Work now plain, intelligible, and eaſy to be read; I have every where in the Notes mentioned where the Defects were, and what were the Words, that I have ventured to alter.

Thus much for the *Greek* Text: In regard to the *Engliſh*, as my Intent was to render the Work intelligible to the *Britiſh* Reader, I have not tied myſelf down to a bare verbal Tranſlation. I have attempted to give, not only his Words, but his Meaning; and in many Places have tranſlated a ſingle Syllable into a whole Sentence, by giving, where that Syllable referred to ſomething ſaid before, a ſhort Recapitulation of the Matter referred to; and by that Means preſerving the neceſſary Connection of Thought; without which, what followed might have appeared obſcure.

To the preſent Edition I have added a *Greek* Index of all *Theophraſtus*'s Words, for which I am obliged to Mr. *Newberry*: As alſo the Account of a new Acid, from a Stone firſt produced in *Sweden*;

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Sweden: And ſome Hints toward new Ways of arranging Foſſils, than which nothing in all the Hiſtory of Nature is more wanted.

ΘΕΟΦΡΑΣΤΟΥ
ΤΟΥ ΕΡΕΣΙΟΥ
ΠΕΡΙ ΤΩΝ
ΛΙΘΩΝ
ΒΙΒΛΊΟΝ.

THEOPHRASTUS's
HISTORY
OF
STONES.

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ΘΕΟΦΡΑΣΤΟΥ

ΤΟΥ ΕΡΕΣΙΟΥ

ΠΕΡΙ ΤΩΝ

[a]ΛΙΘΩΝ

ΒΙΒΛΙΟΝ.

ά. ΤΩΝ ἐν τῇ γῇ συνισταμένων, τὰ μέν ἐστιν ὕδατος· τὰ δὲ γῆς.

β΄. [b]Ὕδατος μὲν τὰ μεταλλευόμενα, καθάπερ ἀργυρὸς, ϗ χρύσος, ϗ τἄλλα.

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[a] THIS excellent Author, notwithſtanding that he has made the Title of the Treatiſe before us promiſe no more than an Account of *Stones*, we ſhall find hereafter, did not mean to confine himſelf in it, ſtrictly and literally to diſcourſe of only that Part of the foſſile Kingdom generally underſtood by this name: but to take into his Conſideration, at the ſame Time, all thoſe other mineral Subſtances which

THEOPHRASTUS's
HISTORY
OF
[a] STONES.

I. OF Things formed in the Ground, ſome have their Origin from *Water*, others from *Earth*.

II. [b] *Water* is the Baſis of Metals; as Silver, Gold, and the reſt: *Earth*

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appeared to him to be formed of Matter of a like Kind with them; as the various *Earths*, &c. in ſhort all thoſe native Foſſils, which, according to his Philoſophy, had *Earth*, not *Water*, for the Baſis of their Formation.

[b] Our Author's general Syſtem of the foſſile World I ſhall not, in theſe Times of greater Knowledge, attempt to vindicate in all its Parts; but muſt do him the Juſtice

γῆς δὲ, λίθος τε ϗ ὅσα λίθων περιττότερα. ϗ εἴ τινες δὴ τῆς γῆς αὐτῆς ἰδιώτεραι φύσεις εἰσὶν, ἢ χρώμασιν, ἢ λειότησιν, ἢ πυκνότησιν, ἢ ϗ ἄλλῃ τινὶ δυνάμει.

to obſerve, that it was far from being either abſurd, or improbable, at the Time when he wrote; when the Sciences, to which the preſent Age owes its Improvements in Natural Knowledge, were ſo little underſtood; and ſo few of the Experiments, which have now given Light into it, had been made; and that it carries at leaſt, an equal Air of Probability, with many that have been ſince formed; and is abſolutely more ſuccinctly, clearly, and philoſophically delivered than any of them all.

The Principles of mixed Bodies, as well thoſe of the *foſſile*, as of the *vegetable* and *animal* Kingdoms, are indeed ſo intimately united, and cloſely combined together, at their original Formation, that we are not to wonder, an Author, who wrote in ſuch early Times, was not clearly acquainted with the exact Manner of their Compoſition: Thoſe who have followed him, even after the Diſcoveries of many ſucceeding Ages, and with the Aſſiſtance of Chemiſtry, the of Stones; as well the more precious, as the common: and of the various *Earths* of peculiar Kinds, whether remarkable for Colour, Smoothneſs, Denſity, or whatever other Quality.

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beſt and ſureſt of all Means of judging, (and which, whatever ſome Men of fertile Imaginations may have thought, we have no found Reaſon to believe was much known in his Time) have yet been of late found to have run into great Errors about them: and even thoſe of the preſent and laſt Age, who have been able to diſcover the Miſtakes of theſe, and have the Advantage of yet greater and farther Improvements in that Science, if they will ſpeak frankly and ingenuouſly, muſt own, that though they have diſcovered the Errors of their Predeceſſors, and are certain they are nearer the real Knowledge of the Myſteries of Nature than thoſe of any other Age have been, they yet are ſenſible, that they are only making farther and farther Advances toward what, perhaps, it is not in human Nature ever perfectly to complete.

Chemical Analyſiſes, when judiciouſly and carefully made, are unqueſtionably the ſureſt and beſt Methods we can uſe, towards the γʹ. Περὶ μὲν οὖν τῶν μεταλλευομένων ἐν ἄλλοις τεθεώρηται. ϖερὶ δὲ τούτων, νῦν λέγωμεν.

Attainment of that Knowledge; and yet, how imperfect our beſt Diſcoveries by theſe may appear to the induſtrious and ingenious of future Ages, may be gueſſed by the Errors we can diſcover in thoſe of but a few before us.

When Chemiſtry became, ſome Time ago, better underſtood and more practiſed than it had probably ever been before, the Profeſſors of it, finding a certain Number of different Subſtances, into which almoſt all mixed Bodies were reſolvible, immediately looked upon theſe as fixed and unalterable in themſelves; and as they found them, in a Manner, in all mixed Bodies, they determined that they were the true *Principles* or *Elements* of which all Bodies were compounded; fixed their Number, and their Names, *viz.* That they were five, *Spirit*, *Sulphur*, *Salt*, *Water*, and *Earth*. Here then the whole Work ſeemed effected, the Secrets of Nature opened, and the true, fixed, and unalterable *Principles* of mixed Bodies clearly known.

But what Figure does this boaſted Philoſophy, this Set of Principles now make?

III. The *Metals* have been conſidered in another Work: the *Stones* and *Earths* of various Kinds, therefore, are to be the Subject of this Treatiſe.

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when our own Experience, and the Diſcoveries of later Chemiſts give us even the unqueſtionable Teſtimony of our Senſes, that no leſs than three of the five are ſo far from deſerving the Name of *Principles* or *Elements*, that they are themſelves mixed Bodies, and reſolvible with proper Care into other diſtinct and different Subſtances. For the ſame Chemiſtry, which has brought *Sulphur* out of a mixed Body, will alſo ſeparate that *Sulphur* into *Salt*, *Water*, and *Earth*; and when it has extracted from another, that *Salt*, they eſteemed ſo true a *Principle*, will afterwards reduce it alſo into *Water* and *Earth*: *Spirit* alſo, we now find, is no other than Oil attenuated by Salts, and diſſolved in Water. This appears by a plain and eaſy Experiment of Mr. *Boyle*'s, *viz.* If Spirit of Wine be mixed with ten or twelve times it's Weight of Water, and ſet in a cool Place, the Salts will fly off, the Water will mix itſelf with the Water in the Mixture, and the Oil be left ſwimming at the Top.

Inſtead of the five Principles, therefore, of the Chemiſts before us, farther Diſcoδ΄. Ἅπαντα οὖν ταῦτα χρὴ νομίζειν, ὡς ἁπλῶς εἰπεῖν, ἐκ καθαρᾶς τινος συνεστᾶναι ϗ ὁμαλῆς ὕλης, εἴτε ῥοῆς, εἴτε διηθήσεως διά τινος γινομένης, εἴτε, ὡς ἀνωτέρω εἴρηται, ϗ κατ᾽ ἄλλον τρόπον

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veries have reduced us to a Neceſſity of owning only two, viſible, obvious, and the Objects of our Senſes: and even theſe two may perhaps hereafter be proved to be more nearly allied to each other than we at preſent imagine: theſe are *Water* and *Earth*; the very *Principles*, and the *only ones* acknowledged by this excellent Author, on whoſe Works I am offering my Remarks; and who, to his immortal Honour be it recorded, diſcovered that by Reaſon and Philoſophy alone, of which we owe the Knowledge to a thouſand tedious Experiments.

His Syſtem, though founded on this excellent Baſis, I do not, as I before obſerved, attempt to juſtify: Obſervations, which it was impoſſible for him to make, have given us the Teſtimony of our Senſes, that Metals do contain more or leſs of an abſolute, genuine, and vitrifiable Earth; and Stones, it is as certain, are never wholly diveſted of

IV. All theſe we are (plainly ſpeaking) to judge formed by the Concretion of Matter pure and equal in its conſtituent Parts; which has been brought together in that State by mere *Afflux*; or by means of ſome Kind of *Percolation*; or ſeparated, as before obſerved, from the impurer Matter it was once among, in ſome other

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that Water which once ſerved to bring their conſtituent Parts together.

But to return to the Principles of mixed Bodies: Reaſon informs us, that theſe two, *Water* and *Earth*, alone can never have made all the Differences, and Virtues of them; we are compelled therefore to acknowledge a third, as obvious to our Reaſon as the others to our Senſes; an active Something, to give that to the Maſs, which Water and Earth alone could not: This unknown Principle is what ſome Chemiſts have called *Acid*, and the Metaphyſicians *Fire*; Words which in their general and common Acceptation convey Ideas very different from thoſe we mean to expreſs by them on this Occaſion, but in the Uſe of which we muſt be indulged, till a more perfect Knowledge of the Thing we mean to expreſs has taught us to give it a more determinate Name.

ἐκκεκριμένης· τάχα γὰρ ἐνδέχεται, τὰ μὲν οὕτως, τὰ δ' ἐκείνως, τὰ δ' ἄλλως [c].

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[c] The Author has here juſtly, clearly, and ſuccinctly given the general Manner, in which the conſtituent Matter of Earths and Stones has been brought together; and hinted at the various other Means by which it is done in other particular Caſes.

The two general Ways he allows are by *Afflux* and *Percolation:* and nothing is more certain than that, by theſe two Methods, the two great Claſſes of the Bodies he is here to treat of, have been brought into a State of Formation; the *Earths* and *Stones* of Strata by *Afflux:* and the *Cryſtals, Spars,* and other Bodies of that Kind, by *Percolation.*

The Agent, in the firſt of theſe Caſes, has been Gravity; and in the other, the continual paſſing of Water through the ſolid Strata.

When we look up to the original Formation of theſe Subſtances, we find the Particles, of which they were to be compoſed, in looſe Atoms, diffuſed, and floating in that confuſed and irregular Maſs of Matter (for that is evidently the Senſe of the Word תהום which we find tranſlated the *Deep)* out of which this Earth was to be formed.

Manner: For perhaps it is effected in ſome Caſes by one; and in others by other of theſe Means [c].

The great Agent in gathering theſe ſcattered Atoms into a Maſs, and ſeparating them from the Water in which they were before floating, ſeems to have been what in the *Moſaic* Account of the Creation is called the *Spirit of the Creator*.

On the Action of this powerful Miniſter, the conſtituent Particles of Matter were collected into a Body, by their own Weight ſeparated themſelves from the Fluid in which they before ſwam; and ſubſided, ſome ſooner, ſome later, in Proportion to their different Gravities.

By this Means the Particles of Stone, for Inſtance, precipitated themſelves and formed a Stratum entire, homogene, and pure; before thoſe of Clay began to ſubſide: and theſe afterwards falling in a Maſs on the Stratum of Stone already formed, conſtituted another of Clay over it: After all this, a Quantity of yet lighter Matter, ſettling on the Surface of this laſt formed Stratum, added to that another of what we call vegetable Mould, or ſomething of like Kind. In this Manner were the different Strata of the Earth formed, and the Difference of the Matter, which was to ſubſide in different

έ. Ἀφ᾽ ὧν δὴ ϗ τὸ λεῖον, ϗ τὸ ϖυκνὸν, ϗ τὸ ϛιλπνὸν, ϗ διαφανὲς, καὶ τἄλλα τὰ τοιαῦτα ἔχȣσι. ϗ ὅσον ἂν ϗ ὁμαλέϛεϱον, ϗ καθαϱώτεϱον ἕκαϛον ᾖ, τοσȣ́τῳ ϗ ταῦτα μᾶλλον ὑπάϱχει.

Parts of the Globe, made that almoſt infinite Variety to be found in the Subſtance of the Strata.

This original Structure of the Earth, however, we are not now to expect to find: the univerſal Deluge has made many and wonderful Alterations in it, which are now every where obvious to our Senſes, and are everlaſting Records of that fatal Cataſtrophe, of which the Earth, in the Condition we now ſee it, is but the Ruin.

There are many and inconteſtable Proofs, that the Surface of the Globe, to a Depth beyond what we ever dig, was, in the Time of that fatal Calamity, diſſolved and reduced nearly into the ſame Condition it was in at the Time of its original Formation: the ſtony, mineral, and even metalline, as well as earthy Matter: floating in the Waters that then covered it, in ſeparate Particles. Theſe, when the Tumult of that Immen-

V. From the Differences of the conſtituent Matter; and of the Manner of its Coaleſcence, the *Concrete* aſſumes its various *Qualities*, as *Smoothneſs*, *Denſity*, *Brightneſs*, *Tranſparency*, and the like; and according as it is more pure and equal, the more does it partake of theſe.

ſity of Waters began to ceaſe, were by the ſame Laws of Gravity again precipitated; and they ſubſided in Proportion to their different Weights; but this not in their original Purity, for the metalline and other heterogene Matter, nay and even extraneous Subſtances, the Shells of Sea Fiſhes, *&c.* if of about equal Gravity, ſubſided among the ſtony Matter amidſt which they were before ſuſpended, and made a Part of the Stratum that Precipitation formed: the lighter Matters, the Earths, Clays, *&c.* afterwards ſubſided into other Strata over theſe: and with them other extraneous Particles and Subſtances, of Gravities like theirs. Thus the preſent Surface of the Globe was formed, in Strata of different Kinds, and that again according to their different Gravities; except where the Motion of the Waters prevented this Regularity, by lodging ſometimes on lighter Strata already formed, other whole ϛʹ. Τὸ γὰρ ὅλον, ὡς ἂν ἀκριβείας ἔχῃ κατὰ τὴν σύστασιν ἡ πῆξις, οὕτως ἀκολουθεῖ καὶ τὰ ἀπ᾽ ἐκείνων.

Beds of weightier Matter, which its immenſe and irreſiſtible Force had taken up, and now in its abating ſuffered to ſubſide again.

This, allowing alſo for the Alterations made by Earthquakes, afterwards burſting, and elevating or ſinking the Strata in many Places, is the preſent Condition of the outer Cruſt of this Earth to a certain Depth, far within which perhaps all our Reſearches lie; and in this Maſs we find, according to the Syſtem of our Author, the Strata of Stone and Earth, formed by the Concretion of Matter, equal in Weight and many other of its Properties, and brought together in that State by mere Afflux, by means of the Action of Gravity: and in the perpendicular Fiſſures of thoſe Strata, and ſome other Places, Cryſtals, Spars, and other like ſubſtances, ſeparated by Percolation from the arenaceous, argillaceous, and other Matter, among which they ſubſided in their ſepa-

VI. On the whole, the more perfectly the *Concretion* has been formed, and the more *equal* in its conſtituent Parts the concreting Matter was, the more does the *Concrete* poſſeſs the peculiar Properties which are owing to that Equality.

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rated Particles; being there brought together by the continual draining of Water through the ſolid Strata; which in its Paſſage had taken them up with it, and there deſerted them in different Manners; and left them to aſſume the Figures which are the natural and neceſſary Conſequences of their Concretions.

Theſe then are the two general Methods of Formation of thoſe Bodies mentioned by our Author; the various others, which he hints at as taking Place in ſome particular Caſes, are too numerous to be all recited here: Terreſtrial and ſparry Matter, waſhed from the Strata by the Water of Springs in their Paſſage, and ſubſiding at ſome Diſtance from their Source, round various Subſtances in Form of Incruſtations, is one: Matter of a like Kind, and ſeparated in a like Manner, dropping from the Tops of Caverns with the Water; and either deſerted by it at the Top, and left in Form of Icicles or

ζ. [d] Ἡ δὲ πῆξις, τοῖς μὲν ἀπὸ θερμοῦ, τοῖς δ' ἀπὸ ψυχροῦ γίνεται. κωλύει γὰρ ἴσως οὐδὲν ἔνια γένη λίθων ὑφ' ἐκατέρων συνίστασθαι τούτων. ἐπεὶ τάτε τῆς γῆς ἅπαντα δόξειεν ὑπὸ πυρὸς, ἐπείπερ ἐν τοῖς ἐναντίοις ἡ πῆξις καὶ ἡ τῆξις.

Stalactitæ; or at the Bottom, and left in Maſſes called *Stalagmitæ*, or *Dropſtones*, is another very frequent one. Many others there alſo are; but the Bodies formed by theſe, as well as thoſe, though not brought together by mere Percolation, or mere Afflux, are however, in general, of the Number of thoſe formed of Particles originally brought together by the one or the other of theſe Means, and therefore very juſtly reducible under them as general Heads. What the Author adds of the various Stones and Earths, thus formed, owing their different Qualities to the Variety and Purity of the conſtituent Matter, and of the Manner of their Concretion, is plain, evident, and inconteſtable.

[d] The Author has here, in his accuſtomed

VII. [d] The Concretion is, in ſome of theſe Subſtances, owing to *Heat*; and in others to *Cold*. There is perhaps nothing to hinder but that the Coaleſcence of ſome Kinds of *Stones* may be occaſioned by the one, and of others by the other of theſe Cauſes: though that of the *Earths* of all Kinds ſeems owing only to *Heat*. From theſe contrary Cauſes, however, may happen the Concretion, or Diſſipation of contrary Subſtances.

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clear and ſuccinct Manner, given his Opinion in regard to the Cauſes of the Concretion of that Matter, the nature of which he had before deſcribed, for the Formation of the Bodies which are to be the Subject of the preſent Treatiſe.

The certain and immediate Cauſe of the Coheſion of theſe Particles, which had before, by their Gravity, been precipitated from among the fluid Matter in which they were at firſt ſuſpended, was that univerſal Property in Matter called Attraction. The Preſſure of the circumambient Atmoſphere may ſerve to account for the Coheſion of large Maſſes of Matter: but the minute Contacts of leſſer Particles of it, which ſometimes cohere with a Force almoſt infinitely greater than the Preſſure upon them can be ſuppoſed to influence, reduce us to a Neceſſity of having Recourſe to this other

ή. Ἰδιότητες δὲ πλείους εἰσὶν ἐν τοῖς λίθοις· ἐν γὰρ τῇ γῇ χρώμασί τε, ϗ γλισχρότητι, ϗ λειότητι, ϗ πυκνότητι, ϗ τοῖς τοιούτοις αἱ ῥοαὶ διάφοροι· κατὰ δὲ τὰ ἄλλα σπάνιοι.

Power of Attraction; a Property in all Matter, by which the Particles of Bodies draw one another with a certain Force, which acts infinitely more intenſely at the Contact, or extremely near it, than at any determinate Diſtance.

How far the Heat, which is apparently manifeſt to our Senſes at great Depths in the Earth; and is from thence, and from much greater Depths than we are ever likely to have Opportunities of being acquainted with, continually paſſing upwards to the Surface, may have been concerned in diſſipating the remaining Part of the Water, which had ſerved to bring the Particles of Stones and Earths together; and, by that means, been inſtrumental to the bringing them into their preſent State; and how far the Cold about the Surface may have aſſiſted in the Formation of others, by preventing the Diſſipation or farther Riſe of their conſtituent Par-

VIII. There are in *Stones* of different Kinds many peculiar Qualities, which ariſe from this, that there are many very great Differences both in the Matter and Manner of the Affluxes of the terreſtrial Particles from which they were formed; of which thoſe in regard to Colour, Tenacity, Smoothneſs, Denſity, and the like Accidents, are frequent; though thoſe in other more remarkable Properties, are not ſo common[e].

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ticles, which had been waſhed from among the Matter of the Strata by the Water which continually alſo aſcends from below towards the Surface, inceſſantly pervading them, and detaching and bearing up with it theſe Particles from among them, is a ſubject of too nice Enquiry, and too long to be particularly decided here. The bare mention of it may however ſerve to explain in what Manner Heat and Cold may be concerned in the reducing ſome of the foſſile Subſtances into the State wherein we find them; and how Heat would have deſtroyed the very Means of Coaleſcence in thoſe Subjects, to the Formation of which Cold has, according to this Philoſophy, been eſſential; and Cold, on the contrary, muſt have prevented what Heat uninterrupted might have had Power of doing, in the others.

[e] The Author, having now treated of the

ϑ'. Τοῖς δὲ λίθοις αὗταί τε· ϗ πρὸς ταύταις αἱ κατὰ τὰς δυνάμεις, τοῦ τε ποιεῖν, ἢ πάσχειν, ἢ τοῦ μὴ πάσχειν· τηκτοὶ γὰρ, οἱ δ' ἄτηκτοι· ϗ καυστοὶ, οἱ δ'

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conſtituent Matter of theſe foſſile Subſtances, and the manner and Cauſes of its Coaleſcence, in order to their Formation, comes here to the Conſideration of the Differences of the diſtinct Claſſes, Genera, and ſeparate Species of them. Theſe he very juſtly and philoſophically deduces from the different Matter of which they are formed, and the various Elaborations it has paſſed in the Affluxes by which it has been brought together. The terreſtrial Matter, which ſerves as the Baſis of their Formation, he obſerves, is very commonly found differing in Colour, Denſity, *&c.* and hence the Stones formed of it have very frequently theſe Differences; which make the many various Species of the common Strata of them: but that there are alſo other Varieties in this

IX. Theſe Qualities *Stones* have, therefore, from the common Differences of the Matter, and Manner of the Affluxes of their conſtituent Parts: But beſides theſe, they have others [f] which ariſe from the more peculiar Powers of their concreted Maſſes: Such are their acting upon other Bodies; or being ſubject, or not ſubject to be acted upon by them. Thus ſome are fuſible, others will never liquify in the Fire; ſome may be calcined, others are incombuſtible;

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coaleſcent Matter, in regard to more peculiar Qualities, which are more rarely found, but which, wherever they are, make Differences in the Body formed from them, of other and more remarkable Kinds: this he goes on to ſhew in their proper Places.

Some Editions of this Author have it *πνοαὶ διαφοραὶ*, and others *πολλαὶ διαφοραὶ*, in the laſt Line of this Sentence; the *ῥοαὶ διαφοραὶ* is a very rational and judicious Alteration of *De Laet*'s, and in all Probability was the true original Reading.

[f] The common Differences of the more frequent and large Maſſes of Stone having been now accounted for, from the frequent Diverſities of the Earths of which they were formed; which are found to differ, like them, in the

ἄκαυστοι. ϗ ἄλλα τούτοις ὅμοια. ϗ ἐν αὐτῇ τῇ καύσει ϗ πυρώσει πλείους ἔχοντες διαφοράς.

ί. [8] Ἔνιοι δὲ τοῖς χρώμασιν ἐξομοιοῦν λέγονται δυνάμενοι τὸ ὕδωρ, ὥσπερ ἡ σμά-

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common Accidents of Colour, &c. and even much more than' they, in every Pit; the Author now proceeds to enumerate the Differences of a more remarkable Kind, obſervable in the more rare and valuable Species, and occaſioned, according to his Syſtem, by Diverſities of leſs frequent, and therefore more remarkable Qualities in the Matter from which they were formed: which, together with the more ſingular Operations of Nature, in ſeparating and afterwards bringing that Matter into a Maſs, have imparted to the formed Subſtance *Qualities*, or, as he chuſes to expreſs it by a Word of greater Signification, *Powers* more ſingular and obſervable than thoſe occaſioned by leſs eſſential and more common Varieties in both.

[8] After aſſigning the Cauſes of the various Figures and Qualities as well of the common, as the more rare and precious Kinds of *Stones* and *Earths*, the Author here enters into a Detail of what they are.

and in others, other ſuch particular Properties are obſervable. To this it may be added, that in the Action of the Fire on them, they alſo ſhew many Differences.

X. [1] Some are ſaid to have a Power of making Water appear of their own Colour, as the *Emerald.* Others of petri-

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The Emerald is the Stone whoſe Properties he begins with: but as he only hints in this Place, at what he more particularly explains himſelf upon ſome Pages after; I ſhall reſerve what I have to offer, on this Subject, to that Part of the Work, where there will be a more immediate Opportunity of comparing it with his own Words.

The Stone he next mentions, and of which he has recorded the petrifying Power, but not the Name, is the *Lapis Aſſius*, or *Sarcophagus*. The *Aſſian*, or Fleſh-conſuming Stone. The *Sarcophagus, Boet.* 403. *Aſius vel Aſſius Lapis, Charlt.* 251. *Sarcophagus, ſive Aſſius Lapis, De Laet.* 133. *Aſſius Lapis, Salmaſ. in Solin.* 847. *Plin.* Book 36. Chap. 17.

This was a Stone much known, and uſed among the *Greeks* in their Sepultures, and by them called σαρκόφαγος from its Power of conſuming the Fleſh of Bodies buried in it; which it is ſaid to have perfectly effected in forty

ραγδος. οἱ δ᾽ ὅλως ἀπολιθοῦν τὰ τιθέμενα εἰς ἑαυτούς. ἕτεροι δὲ ὁλκήν τινα ϖοιεῖν. οἱ δὲ βασανίζειν τὸν ἄργυρον, ὥσπερ ἥτε καλουμένη λίθος Ἡράκλεια, ϗ ἡ Λυδή.

Days.' This Property it was much famed for, and all the ancient Naturaliſts mention it: But the other, of turning into Stone Things put into Veſſels of it, has been recorded only by this Author and *Mutianus*, from whom *Pliny* has copied it; and from him ſome few only of the later Naturaliſts. The Account *Mutianus* gives of it is, that it converted into Stone the Shoes of Perſons buried in it, as alſo the Utenſils, which it was in ſome Places cuſtomary to bury with the Body; particularly thoſe the Perſons while living had moſt delighted in. The Utenſils he mentions are ſuch as muſt have been made of many different Materials; whence it appears, that this Stone had a Power of conſuming only Fleſh; but that its petrifying Quality extended to Subſtances of very different Kinds. Whether it really poſſeſſed this laſt Quality, or not, has been much doubted; and many have been afraid, from its ſuppoſed Improbability, to record it. What has much encouraged a Diſbelief of it is *Mutianus*'s Account of its thus taking Place on fying, or converting wholly into Stone, whatever is put into Veſſels made of them. Others have an attractive Quality; and others ſerve for the Trial of Metals, as that called the *Heraclian*, or *Lydian* Stone.

Subjects of different Kinds and Textures: But this, in my Opinion, is no Objection at all, and the whole Account, very probably, true. Petrifactions, in thoſe early Days, might not be diſtinguiſhed from Incruſtations of ſparry or ſtony Matter; as even, with many People, they are not to this Day; the Incruſtations of Spar on Moſs and other Subſtances, in ſome Springs, being yet called by many petrified Moſs, &c. and theſe might eaſily be formed upon Subſtances encloſed in Veſſels, made of this Stone, by Water; if the Situation was in the Way of its paſſing through the Pores, diſlodging from the common Matter of the Stone, and carrying with it ſparry or other ſuch Particles, and afterwards leaving them, in Form of Incruſtations, on whatever it found in its Way. By this Means Things made of Subſtances of ever ſo different Natures and Textures, which happened to be encloſed, and in the Way of the Paſſage of the Water, would be equally incruſted with, and in Appearance ιά. Θαυμασιωτάτη δὲ ϗ μεγίϛη δύναμις, ἔιπερ ἀληθὲς, ἡ τῶν τίκτων [h].

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turned to Stone; without regard to their different Configuration of Pores or Parts.

The Place where this Stone was dug was near *Aſſos*, a City in *Lycia*, from whence it had its Name; and *Boetius* informs us, that in that Country, and in ſome Parts of the Eaſt, there were alſo Stones of this Kind, which, if tied to the Bodies of living Perſons, would, in the ſame Manner, conſume their Fleſh.

The Stones mentioned next, as having an attractive Power, are the Load-ſtone, *&c.* but as theſe and the Lapis Lydius are hereafter deſcribed more at large by the Author, I ſhall reſerve to that Place what I have to add in regard to them.

[h] This is one of the many Paſſages for which this excellent Author has been cenſured by Perſons who had never ſufficiently ſtudied, or, perhaps, even read him (as I hope to prove has been the general Caſe in the Accuſations to which he has been ſubject) and this has been as much miſunderſtood and miſrepreſented as any one of them all.

Pliny has given a Handle to the Accuſations of him, in this Place, by ſaying, that he and *Mutianus* believed there were Stones which

XI. The greateſt, however, and moſt wonderful of all the Qualities of *Stones* is that (if the Accounts of it are true) of thoſe which bring forth young [h].

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brought forth young. *Idem Theophraſtus et Mutianus eſſe aliquos lapides qui pariant credunt.* This has been a ſufficient Source of Cenſures on the Author: moſt of thoſe who quote, or mention him, never having given themſelves the Trouble of learning any Thing more of him than what *Pliny* has told them; as this, and many other Paſſages, frequently quoted from him, to be hereafter conſidered, will abundantly prove. But, with *Pliny*'s Leave, I muſt obſerve, that I find no Reaſon here to imagine, that *Theophraſtus* ever believed any ſuch Thing. He mentions it, on the contrary, as a Thing which he did not believe; but which, as it was generally reputed true, and a very remarkable *Property* of a Stone, he could not avoid mentioning in a Place where he was profeſſedly writing on that Subject. He would not however let it paſs, even though he did allow it a Place, without frankly expreſſing his own Suſpicion that it was but an idle and groundleſs Story.

The Stone meant is the Ætites, or Eagle Stone; the *Ætites Aquilinus. Linn. Ætites, ſeu Aquilinus Lapis, Worm.* 77. *Charlt.* 31. *Lapis Ætites, Boet.* 375. *De Laet.* 114. *Æti-*

ιϐʹ. Γνωριμωτέρα δὲ τῶν, ϗ ἐν ϖλείοσι κατὰ τὰς ἐργασίας. γλυπτοὶ γὰρ ἔνιοι,

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tæ, *Geſn. de Lap.* 10. famous for its imaginary Virtues in aſſiſting in Delivery, preventing Abortions; and, which it at leaſt equally poſſeſſes, of diſcovering Thieves. That the general Opinion was long what our Author records as reported of it, is eaſily proved: and we cannot wonder at that's being firmly believed, when we find ſuch Virtues as the other, of choaking Thieves, *&c.* all certainly credited; and recorded by the graveſt Authors.

That it was, long after, as well as before this Author's Time, believed to have this Property of bringing forth young, is evident from the Words *prægnans*, *gravidus*, *Uterus*, ἐγκύμων, *&c.* ſo conſtantly uſed in deſcribing it. *Pliny* ſays of it, *eſt autem lapis iſte* prægnans *intus, quum quatias, alio velut in* utero *ſonante*. *Dioſcorides*, ἀετίτης λίθος ὡς ἑτέρȣ ἐγκύμων λίθȣ ὑπάρχων. And numberleſs Inſtances might be brought of the earlieſt as well as later Authors uſing the like Expreſſions; evidently teſtifying, that the Stone was, or had been generally believed to poſſeſs that ſo remarkable Quality; which perhaps this Author, who is accuſed of believing, was the very firſt who ever doubted.

In order to the eſtabliſhing a more rational

XII. But the moſt known and general Properties of Stones are their ſeveral Fitneſſes for the various Kinds of Work. Some of them are proper for engraving

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Account of the Nature and Formation of this Stone, it may not be amiſs here to look into the Formation of Pebbles and Flints in general; of which Claſs this is a Species. By this Enquiry we ſhall find, that the Callimus, or included Stone, is, inſtead of a young one, indeed the older of the two; and has had ſome Share in the Formation of its Parent, as the outer one was generally eſteemed; though that has nothing to do with its Production.

The Flints and Pebbles, we now every where ſee, have been all formed in the Waters of the Deluge, by the mere Afflux of their conſtituent Matter. The firſt Concretion of this was generally in ſmall Quantity, and formed a little Lump or Nodule; and this afterwards encreaſed in Bigneſs by the Application of freſh Matter, in different Quantities, and at different Times to it. If this new Matter happened to be of different Textures and Appearances, the ſeparate Quantities, that at Times affixed themſelves, became different Cruſts of various Colours; as may be obſerved frequently in our common Pebbles; if of the ſame Nature and Colour, and affixed nearly all at once, the Appoſition became imperceptible afκαὶ τορνευτοὶ, καὶ ϖρισοί. τῶν δὲ οὐδὲ ὅλως ἅπτεται σιδήριον, ἐνίων δὲ κακῶς καὶ μόλις [i].

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terwards; and the Maſs formed of the whole appeared a Flint, or Pebble, of regular and ſimilar Subſtance: and if, laſtly, this Matter, before its Application, had received other various-coloured Affluxes into it, they are ſeen in the Concrete, in irregular Lines and Striæ, and it becomes an Agate, or other ſuch Stone. In all theſe Caſes the Matter firſt formed into a Maſs, yet remains in Form of a central Nucleus, in or near the Middle of the Stone, according to the equal or irregular Quantity of the additional Matter which formed each Cruſt; this being ſometimes all of the ſame Colour with that Nucleus, remains unperceivable, but ſometimes, as before obſerved, being of different Colours, is evident to the Eye.

This Nucleus in ſome, indeed moſt of theſe Maſſes, being of the ſame Texture with the reſt, has remained in its Place, and become a viſible Spot of equal Hardneſs and Beauty with the reſt of the Stone: in others, after the Application of ſome, or all the outer Cruſts, it has ſhrunk into a ſmaller Compaſs, detached itſelf from the inner Cruſt, and become a looſe, on; others may be ſhaped by the Turner's Tools; others may be cut or ſawed: Some alſo there are which no Iron Inſtruments will touch; and others which are very difficultly, or ſcarce at all to be cut by them[i].

ſeparate Stone, rolling about in the Cavity, now too large for it; and rattling in it when ſhaken. This is our Ætites; and the central Nucleus ſo detached, and ſhrunk, is its Callimus. In others, this central Nucleus has crumbled into looſe, ſandy, or earthy Matter, and remaining in that Form, looſe in its Cavity, has made what is called the Geodes, or baſtard Eagle Stone. The Geodes, and the Eagle Stone, ſo much renowned for Virtues, and ſo fabulouſly talked of as to their Origin, are therefore no other than common Pebbles, the central Nuclei of which have, from the different Nature and Texture of the Matter of which they were formed, detached themſelves from the ſuperadded Cruſts, and either ſhrunk, on becoming more dry, into ſmaller Dimenſions; or fallen into the original Grit, or ſandy Matter, of which they were firſt compoſed.

[i] I cannot but obſerve from this Paſſage of our Author, that, ſo early as in his Time, not only very many Species of precious Stones were in Uſe, and their different Degrees of Hardneſs familiarly known, but that the various

ιγ´. Εἰσὶ δὲ πλείȣς ϗ ἄλλαι κατὰ ταύτας ἰδιότητας διαφοραί. αἱ μὲν ȣ̃ν κατὰ χρώματα, ϗ τὰς σκληρότητας, ϗ μαλακότητας ϗ λειότητας, ϗ τἄλλα τὰ τοιαῦτα, διὰ τὸ περιττὸν, πλείοσιν ὑπάρχȣσιν[k].

Manners of working them were alſo well underſtood; even better than in the ſucceeding Ages, for he is here clear in the Diſtinction between the γλυπτοὶ and τορνευτοὶ, which much later Writers of his Nation are very juſtly accuſed of having confounded. The γλυπτὸν and τορνευτὸν of the Greeks, however confuſedly miſunderſtood by ſome of them, and uſed as ſynonymous Terms by others, are really Words of diſtinct and determinate Senſe; and ſignify the *Cælatura* and *Tornatura* of the *Latins*; which, I think, it is evident from this Paſſage, was well known to this Author, however it came to be forgotten afterwards.

[k] The Author, having now mentioned ſeveral very remarkable Properties in Stones, and their general Characters as to Difference of Texture, from the different Ways they are to be worked, proceeds here to relate the many other differences they have in their ſeveral peculiar Qualities, which they owe, as he has

XIII. There are alſo, beſides theſe, many other Differences obſervable in them, according to their ſeveral Qualities; of which thoſe in regard to Colour, Hardneſs, Softneſs, Smoothneſs, and the like Accidents, becauſe of the Number and Diverſity of thoſe Qualities, happen to many [k].

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before eſtabliſhed it, to the different Matter and Manner of the Affluxes of their conſtituent Parts: and ſuch of theſe as ariſe from the more common Varieties of terreſtrial Matter, in Colour, *&c.* he again obſerves, are common to many and great Quantities.

This is only repeating, in its due Place, and at the Head of that Claſs of Stones to which it properly belongs, what he had before given as a Part of his general Syſtem: it was long, however, before this Paſſage was in a Condition to be thus underſtood; for after the Word ταύτας, there was by Defect in the Copy a Gap left, which ſome Editors had filled up with the Word διαφοραὶ only, but others, finding the Hiatus too large for that alone, have given their Opinion that the Word ἰδιότητας is alſo to be added. In that Manner I have written it, and it appears evidently to me to have filled up a Gap in the Senſe, as well as in the Writing; by making the Beginning, as well as all ιδ΄. Καὶ ἐνίοις γε κατὰ τόπον ὅλον, ἐξ ὧν δὴ ϗ διωνομασμέναι λιθοτομίαι, Παρίων τε ϗ Πεντελικῶν, ϗ Χίων τε ϗ Θηβαϊκῶν[1].

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the reſt of the Sentence, clearly refer to what I have obſerved the Author to have ſaid before, Page 20, and of which this is no more than a Recapitulation, in its proper Place.

[1] The Author here gives an Account of the various Kinds of Marble and Alabaſter known in his Time; and even ſo early as that, we find the *Parian* familiarly known, and, as may very rationally be gueſſed from its being named before all the other Kinds, moſt eſteemed of any. This was originally dug only in the Iſland of *Paros*, and the Strata of it were always found ſo cracked, that it was ſcarce ever to be had in Pieces of more than about five Feet long; ſo that the fineſt Blocks of it only juſt ſerved for Statues of a natural Size: they were extremely valued for the Elegance of their Colour, and the excellent Poliſh they would take.

A Marble of this Kind, but perhaps not exactly the ſame with this of the Ancients, is now dug in many Parts of *Italy*; and much eſteemed for the ſame Qualities.

The *Pentelican*, the Kind he next mentions,

XIV. And to ſome indeed through whole Countries; from which Quarries of them have obtained their Names; as the *Parian*, the *Pentelican*, the *Chian*, and the *Theban* [l].

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is now wholly unknown, and has been ſo for many Ages.

The *Chian* was a dead black Marble, ſo named from the Iſland of *Chios*, where it was dug; ſomething of the Kind of the Lapis Obſidianus of *Æthiopia*, and, like it, in ſome Degree tranſparent.

The *Theban* is a Marble well known to this Time; it is red, variegated with other Colours, and is of two Kinds: The one ſofter, and marked only with yellow; which is the *Brocatello* of the modern *Italians*; the other extremely hard and variegated with Black, White, and many other Colours: This is the *Pyrrhopœcilus* and *Syenites* of *Pliny*, and the Granate of the Moderns. Many of the Works of the Ancients in *Greece*, *Italy*, and elſewhere, are of this Marble.

The Alabaſter is the *Alabaſtrites*, *Boet.* 490. *De Laet.* 166. *Worm.* 42. *Matthiol.* 1386. It is a well known Stone, white, and approaching to the Nature of Marble, but much ſofter. The *Alabaſtrum* and *Alabaſtrites* of Naturaliſts, though by ſome eſteemed ſynonymous Terms,

ιέ. Καὶ ὡς ὁ ἐν Αἰγύπτῳ περὶ Θήβας ἀλαβαστρίτης. ϗ γὰρ οὗτος μέγας τέμνεται· ϗ ὁ τῷ ἐλέφαντι ὅμοιος, ὁ Χερνίτης καλούμενος· ἐν ᾗ πυέλῳ φασὶ ϗ Δαρεῖον κεῖσθαι. ϗ ὁ πῶρος ὅμοιος τῷ χρώματι, ϗ τῇ πυκνότητι τῷ Παρίῳ, τὴν δὲ κουφότητα μόνον ἔχων τῷ πωρῳ. διὸ ϗ ἐν τοῖς σπουδαζομένοις οἰκήμασιν, ὥσπερ διάζωμα τιθέασιν αὐτὸν οἱ Αἰγύπτιοι.

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and by others confounded with one another, are different Subſtances; the *Alabaſtrum* is properly the ſoft Stone, of a gypſeous Subſtance, burning eaſily into a Kind of Plaiſter; and the *Alabaſtrites* the hard, bearing a good Poliſh, and approaching to the Texture of Marble. All the later Authors confirm what *Theophraſtus* here mentions, of its being found about *Thebes*. The Quarries of it there are not yet exhauſted, and probably will not be in many Ages.

This Stone was by the *Greeks* called alſo ſometimes Onyx, and by the *Latins*, *Marmor Onychites*, from its Uſe in making Boxes for preſerving precious Ointments, which Boxes

XV. In *Ægypt*, about *Thebes*, there is alſo found the *Alabaſter*, which is dug in large Maſſes; and the *Chernites*, which reſembles *Ivory*, and in which, it is ſaid, *Darius* was buried; as alſo the *Porus*, which in Colour and Hardneſs emulates the *Parian* Marble, though ſingular in its remarkable Lightneſs: in this it reſembles the *Tophus*: and on Account of this the *Ægyptians* generally uſed it in the Partitions of their more elegant Edifices.

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were commonly called Onyxes and Alabaſters. Thus *Dioſcorides* ἀλαβαϛρίτες; ὁ καλȣ́μενος ὄνυξ. And hence have been a thouſand Miſtakes in the later Authors of leſs reading; who have miſunderſtood *Pliny*, and confounded the Onyx Marble, as the Alabaſter was frequently called, with the precious Stone of that Name. This Author, however, cannot be accuſed of having given any Occaſion to the Confuſion: for though the Onyx was, in his Time, ſometimes called alſo Alabaſter, as well as the Alabaſter Onyx, from their common Uſe in theſe Boxes, he here clearly explains himſelf as to which Kind he is treating of, by obſerving, that it is that which is dug in large Maſſes; by way of Diſtincιϛ΄. Εὑρίσκεται ϗ μέλας αὐτόθι διαφανὴς, ὁμοίως τῷ Χίῳ, ϗ ϖαρ᾽ ἄλλοις δὲ ἕτεροι ϖλέιȣς.

ιζ΄. Αἱ μὲν ȣ̃ν τοιαῦται διαφοραὶ, καθάπερ ἐλέχθη κοινότεραι πλέιοσιν. αἱ δὲ

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tion from the Onyx or Alabaſter Gem, as what we now call only the Onyx was then ſometimes called.

The Chernites, or Chermites, was a white Marble, uſed in the Sepultures of the ancient *Greeks*, *&c.* and about which there have been many Miſtakes among the later Authors: theſe, as the Species of Marble is now unknown among us, it would be but idle to enquire into.

The Porus was alſo a Marble much in Eſteem with the Ancients, but unknown to us. Its peculiar Property, as our Author obſerves, was its Lightneſs. It cut well, and bore a tolerable Poliſh, and the Statues, *&c.* made of it, were common in *Greece*, and called *Πώρινα*, as thoſe of the Parian Marble were called *Πάρια*. The Tophus, to which our Author compares this Marble for Lightneſs, is a rough Stone of the Pumice Kind, brittle, and eaſily crumbling into Powder. It is not much known in *England*, but common in *Germany*, where it is uſed

XVI. There is alſo found in the ſame Place a tranſparent *Stone*, ſomething like the *Chian:* and in others, there are many other Kinds.

XVII. Theſe are the Differences which have been mentioned as common to many *Stones*. But thoſe which ariſe

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inſtead of the Pumice, and called *Topſſtein* and *Tugſtein*. This was a Stone well known among the *Greeks*, and was what they called the Porus, without any Addition; whereas the other, here deſcribed among the Marbles by the Author, was called the Porian Marble; from its Reſemblance to this Porus. The dark tranſparent Stone, next mentioned, was probably of the Obſidianus Kind; as well as the Chian. The Antients had two or three of theſe dark Marbles, of fine Texture, in great Uſe among them. They bore a good Poliſh, were tranſparent in ſome Degree when cut into thin Plates, and reflected the Images of Things as our Looking-glaſſes do: the fineſt Kind was, for this Reaſon, called ὀψιανὸς ἀπὸ τῆς ὄψεος, which was afterwards written by the *Latins*, *Opſianus*, *Opſidianus*, and *Obſidianus*. And the true Origin of the Name being forgotten from the falſe ſpelling the Word, After-ages thought it had received it from one *Obſidius*, whom they imagined the firſt Finder of it.

κατὰ τὰς δυνάμεις [m] τὰς προειρημένας, οὐκ ἔτι τοῖς ὅλοις ὑπάρχουσιν, οὐδὲ συνεχέαις λίθων, οὐδὲ μεγέθεσιν· ἔνιοι δὴ καὶ σπάνιοι πάμπαν εἰσὶ καὶ σμικροὶ, καθάπερ ἥτε, σμάραγδος, καὶ τὸ σάρδιον, καὶ ὁ ἄνθραξ, καὶ ἡ σάπφειρος, καὶ σχεδὸν λόγῳ τῶν εἰς τὰ σφραγίδια γλυπτῶν. οἱ δὲ καὶ ἐν ἑτέροις εὑρίσκονται διακοπτομένοις.

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[m] The Author, having now gone through the general Differences of the Strata of Stone, ariſing from common Cauſes; and having particularly mentioned, and in few Words deſcribed the various Species of Marble known in his Time, comes now to the Conſideration of certain more extraordinary Qualities in Stones of ſmaller Size; ariſing from the Powers of more particular Combinations of Matter in their Formation. The particular Stones he mentions in this Place, as poſſeſſing theſe Powers, are hereafter treated of more at large. I ſhall therefore refer, what I have to obſerve in regard to them, to their proper Places, where they are ſeparately deſcribed. To thoſe particularly named the Author adds a great Number, which he alſo hereafter deſcribes, in the Words τῶν εἰς τὰ σφραγίδια γλυπτῶν, which I

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from the particular Powers before named, are leſs frequent; nor do they, like theſe, happen to whole Strata, or vaſt Maſſes. Some of the Stones, in which they take Place, are very ſcarce and ſmall, as the *Emerald*, the *Carnelian*, the *Carbuncle*, the *Sapphire*; and, in general, all that are cut as *Gems:* and ſome of them are found in dividing other Stones.

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have choſen to tranſlate "that are cut as Gems," not as the literal Meaning of the Words might ſeem to imply, limiting what are added only to thoſe on which Seals were engraven.

It is evident, the Author meant himſelf no ſuch Limitation, ſince he has afterwards deſcribed, among the Stones of this Claſs, many which he expreſsly ſays were too ſmall for this particular Uſe. The Reaſon of his uſing the Word in this Place is, that the *Greeks* had no particular Name for the pellucid Stones, which we call diſtinctly Gems; they called all Stones, whether large or ſmall, hard or ſoft, precious or common, by the general Name λίθος, and diſtinguiſhed them, one from another, by their Epithets only, as διαφανὲς &c. and as the general Uſe of what we call Gems, and for

ιή. Ὀλίγοι δὲ ϗ οἱ περὶ τὴν πύρωσιν, ϗ καῦσιν. ὑπὲρ ὧν δὴ ϗ πρῶτον ἴσως λεκτέον, τίνας ϗ πόσας ἔχουσιν διαφορὰς.

ιθ'. Κατὰ δὴ τὴν πύρωσιν οἱ μὲν τήκονται ϗ ῥέουσιν, ὥσπερ οἱ μεταλλευτοί· ῥεῖ γὰρ ἅμα τῷ ἀργύρῳ, ϗ τῷ χάλκῳ ϗ σιδήρῳ" ϗ ἡ λίθος ἡ ἐκ τούτων. εἰ τοίνυν

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which they had no particular Name, was the ſerving for Seals; they ſometimes, inſtead of diſtinguiſhing them by particular or deſcriptive Epithets, called them *Seal Stones*, and hence the Word Seal Stone, σφραγὶς or σφραγιδίον, became with them a common Word for what we call Gem; and in that Senſe it is evidently uſed here by this Author.

Moſt of the Stones of this Claſs were found to be of ſo compact a Texture, as to reſiſt the Force of Fire; at leaſt of common Fires; and even of the ſtrongeſt known in this Author's Time; the ſolar indeed, which we are able to throw on Bodies, by reflecting Burning-glaſſes, no Stone, not even the Diamond, in all Circumſtances and Poſitions, can withſtand: But as ſome Stones, which he had yet to treat of,

XVIII. Some few of theſe Stones there are, which are ſubject to the Force of *Fire*, and may be burnt. Theſe ſhall be firſt treated of, in Conſideration of what their Differences are.

XIX. In regard to the Action of Fire on them, ſome are *fuſible*, and melt by it; as the metalline Kinds. For the *Stones*, which partake of the Nature of *Metals*, as *Silver*, *Copper*, or *Iron*, [a] melt in the Furnaces with them; either

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were ſubject to great Changes, from the Action of Fire, ſuch as was then commonly uſed on certain occaſions, whether culinary, or for the melting of Metals; theſe he firſt chuſes to deſcribe, and proceeds to give their ſeveral Differences.

[a] The Author is here treating of the various Kinds of *Spars*; formed near the Veins of different Metals, and aſſuming their Colours from, and partaking of the Natures of the particular Metals in the Mines of which they are found. All theſe are formed by the Percolation and Afflux of their conſtituent Matter, which is taken up by the Water continually pervading the Strata; and in its Way ſeparated from the groſſer Particles among which it was at firſt repoſited; and finally tinged with a Co-

διὰ τὴν ὑγρότητα τῶν ὑπαρχόντων, εἴτε ϗ δι' αὐτάς. ὡσαύτως δὲ ϗ οἱ πυρομάχοι, ϗ οἱ μυλίαι ῥέουσιν, οἷς ἐπιτιθέασιν οἱ καίοντες.

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lour from, and in ſome Degree impregnated with the Virtues of the metalline Matter, among which it is deſerted by the Water wherein it was before ſuſpended; and left to coagulate, and aſſume the Form naturally ariſing from the Concretion of its Parts. Where theſe Spars are formed out of the Reach of metalline Matter, and have received, in their Paſſage through the Strata, no Impregnations from it, they are white: this is the natural Colour of their conſtituent Particles. But where they are formed in or about Mines, they, as our Author very juſtly remarks, partake of the Nature of, and, in ſome Degree, owe their Form and Mode of Exiſtence to the particular Metal of the Mine. Their Shape and Virtues are often given them by the metalline Particles mixed with them in their Concretions; their Colours always; and that in a ſtronger or fainter Degree, as there has been more or leſs of that Matter mingled in their Maſſes *.

* See Appendix.

by means of the Humidity of the metalline Matter of which they partake; or of their own Nature: and in this Manner the *Pyritæ* alſo, and thoſe Kinds of them called the *Molares*, melt with the Matter they are laid upon in burning.

If the metalline Particles are in the Mixture in any conſiderable Quantity, the whole aſſumes a Shape peculiar to the Metal to which they belong; if that be *Lead*, the ſparry Concretions are cubic; if *Iron*, rhomboidal; and if *Tin*, they ſhoot into the Form of quadralateral Pyramids. Theſe are the Metals of which we can pretty certainly judge, from the Figure of the Spar about the Mine: as for the others, though they influence the ſhooting of it in no leſs Degree, yet they do not always throw it into ſuch determinate or regular Figures.

But if the metalline Particles, aſſumed into the Spar at the Time of its Concretion, have a very great Power in determining it to a certain Figure; the Influence they have over it, in regard to Colour, is much greater; as all that it has of that is wholly owing to them: and as they are in greater or leſſer Quantities in it, they give it different Degrees, from the ſlighteſt Tinge to the deepeſt Colour.

What Metal has been concerned in effecting κʹ. Οἱ δὲ καὶ ὅλως λέγουσι πάντας τήκεσθαι, πλὴν τοῦ μαρμάρου. τοῦτον δὲ κατακαίεσθαι, καὶ κονίαν ἐξ αὐτοῦ γίνεσθαι. δόξειε δ᾽ ἂν οὕτως ὅλως ἐπὶ πλεῖον εἰρῆσθαι.

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this Change of Colour, is not leſs eaſily and certainly diſcoverable from the Colour itſelf; than what has influenced the Shape, from the Form. If *Lead* has furniſhed the metalline Particles, the Spar is yellow; if *Iron*, red; if *Tin*, black; if *Copper*, it is either greeniſh or blueiſh, according to the Quality of the Menſtruum Nature has furniſhed for diſſolving the Particles of that Metal, and bringing them into a State of mixing in the Concretion; for Acids and Alkalis both diſſolve Copper, but with this Difference of Colour, that the Solution with an Acid is green, and that with an Alkali is blue.

Though this Author was perfectly right, therefore, in his Opinion of theſe Subſtances partaking of the Nature of the Metals among which they were found; he errs in imagining that they are fuſible, and melt with thoſe Metals. He may very well, however, be pardoned in this, ſince it has been an Error which many later Authors, who had more Opportunities of informing themſelves of the Truth

XX. Some abſolutely affirm, that all *Stones* will melt in the Fire except *Marble*, which by burning is reduced to Lime: But this is ſaying abſolutely, and of all, what ought only to be ſaid in general, and of the greater Number.

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than he can reaſonably be ſuppoſed to have had, have alſo fallen into; nay, and many who imagine they underſtand theſe Things very well, from the conſtant Uſe of it in fluxing the Ores of Metals, believe the ſame of it even yet. This is however an abſolutely erroneous Opinion, for Spar is not fuſible, but calcines in the Fires uſed for melting the Ores of Metals. The Uſe it is of, in the fuſing them is this: Thoſe Ores are frequently clogged and loaded with Sulphurs, which make them very difficult of Fuſion; and the Calx of Spar is of the ſame Uſe in that Caſe, that Lime, or any other fixed Alkali would be: That is, it abſorbs thoſe Sulphurs; and by that means deſtroying what would impede the Fuſion of the Ore, does in ſome Senſe aſſiſt its melting; but no one, who ever ſaw the Fuſion of Ore with its Spar about it, ever yet obſerved the leaſt Particle of that to melt.

The Pyritæ and Molares, as many Kinds of them were originally called, are no more capable of Fuſion in the Fire than the Spars. They are Maſſes of mineral, ſaline, and ſulphuκά. Πολλοὶ γὰρ οἱ ῥηγνύμενοι· καὶ διαπηδῶντες ὡς, οὐ μαχόμενοι (κατὰ) τὴν ϖύρωσιν, ὥσπερ οὐδὲ ὁ κέραμος. ὃ καὶ

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reous Matter, either in detached Pieces of different Figures and Textures; or in whole Veins. The various Kinds of them contain different Quantities of different Metals, but generally too ſmall to be worth the Charge and Trouble of working. Gold, Silver, Copper, and Iron are frequently found thus in them. But the principal Subſtances of which they are formed are Salts, Sulphurs, and Earths. The common Copperas of our Shops is made from different Kinds of them, in different Quantities; and no Species yields it in ſuch Plenty as the echinated Kind of the Chalk Pits of *Kent* and *Surrey*. The Marchaſites, as thoſe are particularly called which are not in detached Pieces, but run in Veins, or fill the perpendicular Fiſſures of Strata, often abound with Copper, and with a mineral, arſenical Juice, ſeldom found in the others; ſome of theſe alſo contain Antimony; others Biſmuth, and ſome Iron and Tin. When they are very rich in theſe Metals, they loſe the Name of Marchaſites, and are called Ores. The Mineral, called in ſome Parts of *England Mundick*, is of this Kind, containing Copper and ſometimes other Metals; but the Sulphur is ſo abundant

XXI. For ſome burſt[o] and fly in Pieces in the Fire: as, though not fuſible, yet not of Power wholly to reſiſt the Force of the Heat; which is alſo

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in theſe kinds of Ores, that they are not to be fluxed without great Trouble; the Addition of Lime, or ſome ſimilar Subſtance, is often neceſſary to bring them to fuſe at all, and at beſt they are the moſt troubleſome, and leaſt profitable; unleſs where very rich indeed, of any Ores in the World.

This Author however was not ſingle, though erroneous, in his Opinion of the Pyritæ and Molares melting in the Fire; his Maſter *Ariſtotle* had probably led him into it, who has, *Met. L. 4. c. 6.* τήκεται δὲ καὶ ὁ λίθος ὁ πυρίμαχος, ὥϛε ϛάζειν καὶ ῥεῖν, τὸ δὲ πηγνύμενον ὅταν ῥυῇ πάλιν γίγνεται σκληρὸν, καὶ αἱ μύλιαι τήκονται ὥϛε ῥεῖν.

[o] Some few Species of Flints are Subſtances of this Kind, and above all others that found in whole Strata (not in detached Maſſes or Nodules, as our common Flints are) and called *Chert* or *Whern* in ſome Parts of *England*; a Lump of this, put into a moderate Fire, will, as the Heat penetrates it, fly to Pieces in Scales or thin Flakes, which fall off, from Time to Time, till the whole is reduced to a Maſs of coarſe Powder: but it is an Error to infer from this, that theſe Stones are not fu-

κατὰ λόγον ἐστίν. οἵ τινες ἐξυγρασμένοι τυγχάνουσιν. τὸ γὰρ τηκτὸν, ἔνικμον εἶναι ἀεὶ, ϗ ὑγρότητα ἔχει πλείω.

ſible; for the ſame Stone, or even the very Powder, into which it has been ſhattered by the Fire, put into a Crucible with Salt of Tartar, or any other fixed alkaline Salt, and placed in a ſtronger Fire, will melt, and boil in the Veſſel; and form a very good Glaſs, as I have many Times experienced.

To learn the real Cauſes of the different Degrees of this Fuſibility in different foſſile Subſtances, it will be neceſſary, firſt, to conſider the Cauſe of their Solidity, or, in other Words, of their Coheſion: and this, as I have before obſerved, is that Power reſiding in all Matter, called Attraction.

This Power, it has already been obſerved, is infinitely ſtrongeſt at the Point of Contact: and therefore the Coheſion of all Bodies muſt be in Proportion to the Number of Points in which their conſtituent Particles touch one another. Thoſe Particles therefore which have the leaſt Solidity, with relation to their Surfaces, though they attract leaſt at Diſtances, the Caſe in earthen Veſſels. This is an Effect no way repugnant to Reaſon; for theſe are abſolutely dry, whereas whatever is fuſible muſt be, at leaſt in ſome Degree, moiſt; and retain, to the Time of its Fuſion, more or leſs of its Humidity.

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yet, when they touch, cohere the moſt intimately; but where, from contrary Cauſes, the Coheſion is ſmall, as in ſpherical Bodies, whoſe Surfaces can only touch in a Point, their Particles eaſily recede from one another on any Impulſe; and whenever they are ſet in Motion, Fluidity takes Place.

By what means Fire is an Agent in bringing Things into this State, is eaſily underſtood. Its Particles, which are very powerful and very active, inſinuate themſelves into the Subſtance of the Matter to be melted, break and divide its Parts, and occaſion a much ſmaller Contact of them than there was before, and of Courſe a weaker Coheſion: more fiery Particles continually getting in as the Matter continues on the Fire; more and more diminiſh the Degree of Contact, till at laſt there is not enough of it to keep the Particles from rolling one over another, that is coming into a State of Fuſion.

This is the general Cauſe of the Fuſion of foſſile and other Subſtances; and the different

κϐʹ. Φασὶ δὲ ϗ̀ τῶν ἡλιȣμένων τȣ̀ς μὲν ἀναξηραίνεσθαι τελείως, ὥστ' ἀχρείȣς εἶναι μὴ καταβρεχθέντας πάλιν ϗ̀ συνικμασθέντας· τȣ̀ς δὲ ϗ̀ μαλακωτέρȣς ϗ̀ διαθραύστȣς μᾶλλον. φανερὸν δὲ ὧς ἀμφοτέρων μὲν ἐξαιρεῖσθαι τὴν ὑγρότητα. συμβαίνει δὲ τȣ̀ς μὲν πυκνȣ̀ς ἀποξηραινομένȣς σκληρύνεσθαι· τȣ̀ς δὲ μανȣ̀ς, ϗ̀ ὧν ἡ φύσις τοιαύτη, θραυστȣ̀ς εἶναι ϗ̀ τηκτȣ́ς.

κγʹ. Ἔνιοι δὲ τῶν θραυστῶν ἀνθρακȣ̃νται τῇ καύσει, ϗ διαμένȣσι πλείω χρόνον. ὥσπερ οἱ περὶ Βίνας ἐν τῷ μετάλλῳ ϗ ȣ̔̀ς

Degrees of Fire, they require to bring them to it, are proportioned to their different Contact of Parts, or Degrees of Coheſion. Such as have leaſt Contacts melt ſooneſt, and for this Reaſon Lead melts more readily than Gold. The different Gravity of the Subſtances has nothing to do in this, ſince it is not according

XXII. It is ſaid alſo, that on expoſing to the Sun's Rays ſome are wholly dried up; ſo as to be rendered uſeleſs, unleſs macerated and impregnated again with Moiſture: while others by the ſame means become ſofter and more brittle. It is evident that the Humidity is extracted in both theſe Caſes; the Difference is, that the more denſe and compact Stones harden by this drying; whereas the looſer, and thoſe of a leſs firm Texture, become more brittle and ſoft by it.

XXIII. Some of the more brittle *Stones* there alſo are, which become as it were burning Coals, when put into a Fire, and continue ſo a long time: of this Kind are thoſe about *Bena*, found

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to the Quantity of Matter they contain; but the Number of Points in which the Particles of that Matter touch one another; and for this Reaſon it is that Lead, which is heavier than moſt other Metals, notwithſtanding its ſuperior Quantity of Matter; melts alſo more readily than moſt others.

ὁ ϖοταμὸς καταφέρει. καίονται γὰρ ὅταν ἄνθρακες ἐπιτεθῶσι, ϗ μέχρι τȣ́τȣ χρείας ἐὰν φυσᾷ τις. εἶτ᾽ ἀπομαραίνονται, ϗ ϖάλιν καίονται. διὸ ϗ ϖολὺν χρόνον ἡ χρῆσις. ἡ δ᾽ ὀσμὴ βαρεῖα σφόδρα ϗ δυσχερής [p].

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[p] The Stone here deſcribed is the Lapis Thracius of the later Authors, a Stone much talked of in all the Writings of the old Naturaliſts, and by ſome allowed a Place in the Catalogues of the *Materia Medica*; but now wholly unknown. There is, however, no queſtion, from our Author's Account of this Subſtance, but that it was the very Thing afterwards well known under that Name. *Bina*, or *Bena*, the Place he mentions where it was found, was a Town in *Thracia*; and every Particular he has recorded of it has been ſince applied to the *Lapis Thracius*: Its inflammable Quality, diſagreeable Smell, and the Manner in which it was found, were the ſame with thoſe of the *Thracius* of the later Writers. This was well known to *Dioſcorides*, *&c.* as is evident from what they have ſaid of it; but there has been ſo much Confuſion about it among the Writers ſince, that little more than the

in Mines, and waſhed down by the Torrents, for they will take fire on throwing burning Coals on them, and continue burning ſo long as any one blows them; afterwards they will deaden, and may after that be made to burn again: they are therefore of long Continuance, but their Smell is troubleſome and diſagreeable [p].

Name has been handed down to us: ſome have been of opinion, that it was a kind of *Coal*, others of *Jet*, and others of the *Ampelites*. What is to be gathered from the oldeſt Writers about it is this; that it was a hard bituminous Subſtance, very inflammable, of a brittle Texture, and of a very diſagreeable Smell when burning. It was ſometimes dug, as our Author obſerves, but was principally found in the River *Pontus*, into which it had probably been waſhed from the Banks; in the Strata of which it was originally lodged; by the daſhing of the waves in Storms, or diſlodged by other Accidents. As is alſo the Caſe with the *Pyritæ*, *Ludus Helmontii*, Amber, and many other of the foſſile Subſtances, which are now generally found on the Shores of the Sea or large Rivers: of theſe a diligent Enquirer will always find a much larger Quantity in the Strata of the neighbouring Land, than

κδ΄. Ὃν δὲ καλοῦσι σπῖνον, ὃς ἦν ἐν τοῖς μετάλλοις, τοιοῦτος διακοπεὶς ϗ συντιθεὶς πρὸς ἑαυτὸν, ἐν τῷ ἡλίῳ τιθέμενος, καίεται, ϗ μᾶλλον ἐὰν ἐπιψεκάζῃ, ϗ περιράνῃ τις[q].

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are ſeen waſhed on the Shore; and generally many ſtanding out from among the Matter of the Strata of the Shores or adjacent Cliffs, and ready to be waſhed out by Rains, or diſlodged by the Earth of the Strata cracking after Froſt; and ſo rolled down into the River: though in their natural Situation out of the reach of its Waves; the daſhing of which in Storms and high Tides againſt the Banks, are the more common Means of getting them out.

Moſt of the Editions have it ἀνθρακοῦνται τῇ θραύσει; *Salmaſius* firſt reſtored the Paſſage to its proper Senſe, by altering it to τῇ καύσει, which there is no room to doubt was the original Reading. Nor is that the only Thing in which this Sentence is indebted to that excellent Critic for reſtoring it to its native Senſe and Purity; as indeed are many other Parts of this Author's Works.

[q] The *Spinus*, or, as the excellent Critic juſt mentioned would have it called, *Spilus*, σπῖλος, was another indurated Bitumen of the *Lapis Thracius* Kind, of which *Theophraſtus* is not

XXIV. That alſo which is called the *Spinus*, is found in Mines. This Stone cut in Pieces and thrown together in a Heap, expoſed to the Sun, burns: and that the more, if it be moiſtened or ſprinkled with Water [q].

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the only Author who has recorded this memorable Quality: but we have no Right either to confirm or queſtion it, as the Subſtance is now wholly unknown to us.

The general Characteriſtics of theſe ſolid Bitumens, the Claſs of Bodies the Author is here deſcribing, are, that they are denſe, dry, and friable Subſtances, eaſily inflammable, fuſible by Fire, and condenſing by Cold. They are ſoluble in Oil, not to be diſunited by Water, as the argillaceous Earths are; and yield in Diſtillation a large Quantity of fetid Oil.

The Bodies of this Claſs, known to the Antients and underſtood under this general Name, were, beſide the *Thracius* and *Spinus*, 1. The *Aſphaltum*, called alſo *Bitumen Judaicum*, and by *Serapion*, *Gummi funerum*; this was found in *Dioſcorides*'s Time about *Sidon* in *Phœnicia*, *Zant* in *Sicily*, and in *Judæa*. The Account in the ſacred Writings, of its having been uſed as Mortar in the building the Tower of *Babel*, is unqueſtionable: *Strabo* and others of the Antients aſſerting, that it was found plentifully

κέ. Ο δὲ Λιπαραῖος[r] ἐκπωροῦται τῇ καύσει, ϗ γίνεται κισσηροειδής· ὥσθ᾽ ἅμα τήν τε χρόαν μεταβάλλειν ϗ τὴν πυκνήτητα. μέλας τε γὰρ ϗ λεῖός ἐστι, ϗ πυκνὸς, ἄκαυστος ὤν. γίνεται δ᾽ οὗτος ἐν τῇ κισσήρει διειλημμένος ἄλλοθι ϗ ἄλλοθι, καθάπερ ἐν κυτταρείῳ, καὶ οὐ συνεχής· ὥσπερ

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about *Babylon*; and that the Buildings of the old *Babylon* were of Brick cemented with this Subſtance.

2. The *Piſſaſphaltos*, found, according to *Dioſcorides*, in the Ceraunian Mountains of *Apollonia*; this was not ſo hard as the former, and of a more pleaſant Smell; it is now found in the Campania of *Rome*, near a ſmall Town called *Catho*, where it ouzes through the Crannies of Rocks, and is at firſt of the Conſiſtence of Honey, but ſoon dries and becomes hard.

3. Amber, of which the Author treats hereafter in this Work.

4. Jet, the Gagates of *Dioſcorides*, and black Amber of the Shops; a dry, hard, ſhining Subſtance, of a fine black, burning like Pitch, and emitting a thick black Smoke. Its Name it had from *Gagis*, a Town in *Lycia*, where it was originally found: it is now dug in *Pruſſia*, *France*, *Germany*, *Sweden*, and ſome Parts of *England*.

XXV. [r] But the *Lipara* Stone empties itſelf as it were in burning; and becomes like the *Pumice:* changing at once both its Colour and Denſity; for before burning it is black, ſmooth, and compact. This Stone is found in the *Pumices*, ſeparately, in different Places, and as it were in Cells, no where continuous with the Matter of them. It is

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5. Cannel Coal, the Ampelites of *Dioſcorides*, called alſo *Terra Pharmacitis* by ſome Authors, though its Uſe in Medicine at preſent is almoſt unknown. This is as hard as the foregoing, and takes an excellent Poliſh; we have it in many Parts of *England*, where it is turned into Toys of different Kinds. And

6. The Lithanthrax, or common Coal, well known to all.

Theſe were the ſolid Bitumens, known as ſuch to the Antients, and which, though they were not all known ſo early as in this Author's Days, I judged it not amiſs thus ſhortly to mention here; that it may be obſerved from their Qualities and Deſcriptions, and thoſe of the two mentioned by the Author, that it was neither of theſe that he knew, by either of the two Names of thoſe he has here deſcribed: but that he did know the laſt is certain.

[r] The *Lipara* Stone (ſo called from *Lipara*, one of the Æolian Iſlands, from whence it was

uſually brought among the Pumices, of which thoſe Iſlands always furniſhed a large Quantity) is a ſmall Stone, uſually about the Bigneſs of a Filbert, of an irregular and uncertain Shape, and porous friable Conſtitution, like that of the Pumices, but more eaſily crumbling into Powder between the Fingers than even the ſofteſt Kinds of them. The Colour is generally of a duſky grey, and the whole external Face of it evidently ſhews that it has ſuffered a Change by the Fire. The Ancients had theſe Stones in great Eſteem, and *Pliny* has recorded an idle Tradition concerning them, which, I ſuppoſe, was then generally believed, *ſuffita ea omnes beſtias evocari*; but at preſent they are ſo little regarded, that the Writers on theſe Subjects have even forgot to name them: and *Wormius*, the only Naturaliſt of the more late ones, who had actually received them, and gave them a Place in his Muſeum, and a Deſcription in the Hiſtory of it, ſeems not to have known that they ever had any Name at all. I don't know that any Body elſe has obſerved that his *lapilli cinerei Ætnæ*, are the *Liparis*

ϗ ἐν Μήλῳ φασὶ τὴν κίσσηριν ἐν ἄλλῳ τινὶ λίθῳ γίνεσθαι. ϗ ἐκεῖνος μὲν τούτῳ ὥσπερ ἀντιπεπονθώς. πλὴν ὁ λίθος οὗτος οὐκ ὅμοιος τῷ Λιπαραίῳ.

ſaid, that in *Melos* the Pumice is produced in this Manner in ſome other Stone, as this is on the contrary in it. But the Stone in which the Pumice is found, is not at all like the *Lipara* Stone, which is found in it.

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or *Liparæus Lapis* of the Antients; but his Deſcription ſo exactly agrees with ſome Stones I have, which I received with ſome Pumices from *Hecla*, and have always judged to be the *Liparæi*, that I make not the leaſt queſtion of their being the very ſame: His Words are, *Ejuſdem montis (ſc. Ætnæ) et ab eodem tractu, ad me delati ſunt Lapilli, cinerei, obſcuri & aduſti, qui vi ignis naturam ſuam plane amiſerunt, & poroſi ſunt redditi, læves & inequales, ita ut ad naturam Pumicum quam proxime accedant, ſed friabiliores ſunt & facile in minutiores partes; vel digitorum compreſſu diſſiliant.*

Beſides thoſe which I have from *Iceland*, I have ſometimes ſeen of them among Quantities of Pumice. I cannot ſay I ever had the Fortune to find any one in a Maſs of the Pumice; or ever had an Opportunity of obſerving their Texture before they had paſſed the Fire: but the Account this Author gives of them may probably enough be true in both Circumſtances; it being very common to obſerve ſmall Stones of the Flint, Pebble, and other Kinds, immerſed in Maſſes of a different Texture; and

κϛʹ. Εκπωροῦται δὲ ϗ ὁ ἐν Τετράδι [s] τῆς Σικελίας γινόμενος. τοῦτο δὲ τὸ χωρίον ἐστὶ κατὰ Λιπάραν.

κζʹ. Ὁ δὲ λίθος ἐν τῇ ἄκρᾳ τῇ Ερινεάδι καλουμένῃ πολὺς, ὁμοίως ταῖς Βίναις καιόμενος, ὀσμὴν ἀφίησιν ἀσφάλτου. τὸ δ᾽ ἐκ τῆς κατακαύσεως ὅμοιον γίνεται γῇ κεκαυμένῃ.

κή. Οὓς δὲ καλοῦσιν εὐθὺς ἄνθρακας, τῶν θρυπτομένων διὰ τὴν χρείαν, εἰσὶ γεώδεις. ἐκκαίονται δὲ ϗ πυροῦνται καθάπερ οἱ ἄνθρακες. εἰσὶ δὲ περί τε τὴν Λιγυστικὴν,

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the intenſe Degree of Heat theſe, with the Pumices, muſt have ſuffered, might very probably effect Changes as great or much greater, than between the preſent State of this Stone and what this Author deſcribes to have been its Original.

As to what regards the Pumice itſelf, as the Author hereafter deſcribes it more at large, I ſhall reſerve to that Place what I have to obſerve about it.

[s] The Name of this Place is differently ſpelt in different Editions of this Author, ſome hav-

XXVI. Certain Stones there are about *Tetras*[a] in *Sicily*, which is over againſt *Lipara*, which empty themſelves in the ſame Manner in the Fire.

XXVII. And in the Promontory called *Erineas*, there is a great Quantity of Stone like that found about *Bena*; which, when burnt, emits a bituminous Smell, and leaves a Matter reſembling calcined Earth.

XXVIII. Thoſe foſſile Subſtances that are called Coals, and are broken for Uſe, are earthy, they kindle however, and burn like wood Coals. Theſe are found in *Liguria*, where there alſo is

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ing it Τετράδι, others Τεταρίδι, and probably neither of them right; for there is no mention of any Place in *Sicily* of either the one or the other of theſe Names in the antient Geography: But however uncertain the Place of Production of theſe Stones be, what our Author obſerves of them is very well worth noting, that they became light, porous, and like Pumices from the Action of the Fire. It were much to be wiſh'd we were now acquainted with this Stone, ſince if we knew any which we could by Fire reduce to a Pumice, it would ὅπȣ ϗ τὸ ἤλεκτρον, ϗ ἐν τῇ Ηλέιᾳ, βαδιζόντων Ολυμπιάζε τὴν δι' ὄρȣς. οἷς ϗ οἱ χαλκεῖς χρῶνται [t].

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give us a Light into the Origin of that Body; which we at preſent very much want.

The Subſtance next mentioned is evidently of the Claſs of ſolid Bitumens, and a Species of the *Lapis Thracius* before deſcribed. The Reſiduum after burning, or *Caput mortuum* of all the Bitumens, is a calcined Earth; and Rocks and Promontories are the moſt common Places out of which they are found exſudating.

[t] The Subſtance here deſcribed, whatever Miſtakes there have been among Authors ſince about it, appears to me to be evidently no other than the common Pit Coal; and I have made it appear as clearly ſo in the Tranſlation, only by having properly rendered the Word ἄνθρακες, the careleſsly miſunderſtanding which Word alone has been the Occaſion of all the erroneous Gueſſes about the Subſtance here deſcribed. The Authors of theſe ſeem all to have underſtood the Word ἄνθραξ, as ſignifying Foſſile or Pit Coal; and therefore, as the Author compares the burning of this Subſtance to that, they were neceſſitated to think of ſome other Subſtance that he might here mean; as it was impoſſible he ſhould intend to compare a Thing to itſelf.

Amber, and in *Elis*, in the Way to *Olympias* over the Mountains. Theſe are uſed by the Smiths[t].

Wormius, on this Foundation, imagined, that he meant the Cannel Coal: *Quod Galenus vocat Ampelitidem, &c. Theophraſtus Carbones vocat, quod eorum colorem habeat, & vices gerat.* Thus is *Theophraſtus*, according to Cuſtom, accuſed of ſaying Things he never meant; becauſe the People who quote him have not been at the Pains to underſtand him: ἐκκαίονται δὲ καὶ πυροῦνται καθάπερ οἱ ἄνθρακες, is evidently, they kindle and burn like Wood Coals, or, as we call it, Charcoal; for that is the genuine and determinate Senſe of the Word ἄνθραξ in *Greek*, and *Carbo* in *Latin*; as is evident from the other Works of this Author, *Pliny*, and all the other old Naturaliſts. Even the more correct of the Moderns, when they would expreſs what we call Pit Coal, the Subſtance here deſcribed by the Author, never uſe the Words ἄνθραξ or *Carbo* alone, but always *Carbo foſſilis*, and λιθάνθραξ. See *Woodward, Charlton, Merret*, &c. The ſimilar Uſe of this Bitumen got it the Name of Coal, but always with an Addition that diſtinguiſhed it from what was more commonly and properly ſo called; and expreſſed its not being of vegetable, but foſſile Origin.

κθ΄. Εὑρέθη δέ ϖοτε [v] ἐν (τοῖς) Σκαπτησύλης μετάλλοις λίθος, ὃς τῇ μὲν ὄψει ϖαρόμοιος ὢν ξύλῳ σαπρῷ· ὅτε δ' ἐπιχέοιτό τις ἔλαιον, καίεται· ϗ ὅτ' ἐκκαυθέιη, τότε ϖαύεται ϗ αὐτὸς, ὥσπερ ἀπαθὴς ὤν.

λ΄. Τῶν μὲν οὖν καιομένων αὗται διαφοραί.

λά. Ἄλλο δέ τι γένος ἐςὶ λίθων, ὥσπερ ἐξ ἐναντίων ϖεφυκὸς, ἄκαυςον [w] ὅλως,

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[v] It is much to be quſtioned, whether this was the true original Reading, and genuine Senſe of the Author; in all probability ſome Errors in the old Editions have made this Paſſage expreſs what he never meant to ſay. The Subſtance, and indeed the only Subſtance deſcribed by the other antient Naturaliſts as reſembling black Wood, is the Gagates or Jet, before mentioned among the Bitumens: but that has no ſuch Quality as the Author has here aſcribed to this Stone of *Scapteſylæ*.

The Antients had a common Opinion of the Bitumens, that the Fire of them was en-

XXIX. There[v] is alſo found in the Mines of *Scapteſylæ* a Stone, in its external Appearance ſomething reſembling rotten Wood; on which, if Oil be poured, it burns; but when the Oil is burnt away, the burning of the Stone ceaſes, as if it were in itſelf not liable to ſuch Accidents.

XXX. Theſe then are the Differences of the Stones which are ſubject to the Force of Fire.

XXXI. But there is another Kind of Stone, formed, as it were, of contrary Principles, and entirely incombuſtible[w]:

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creaſed by Water; and extinguiſhed by Oil; and very probably this was the Sentiment originally delivered here by the Author; however Errors upon Errors in different Copies of his Works may ſince have altered the Senſe of them. The Stone itſelf was probably a Bitumen of the *Lapis Thracius* Kind, as the Place from whence it has its Name was a Town of that Country.

[w] The Author having now gone through the different Effects of Fire on the various Kinds of Stones which are ſubject to be acted upon by it, comes here to the Conſideration of

[x] ἄνθραξ καλȣ́μενος. ἐξ ȣ̃ ϗ τὰ σφαγίδια

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certain others, which either from the different Matter of their conſtituent Particles, or the different Manner of their Combinations, he eſteems of a Texture not to be injured by it; but altogether ſafe againſt its Efforts; and, as his own Words expreſs it, incombuſtible.

None of theſe indeed are of Power to reſiſt the ſolar Fire collected by a great reflecting Burning-glaſs; but, in general, are firſt calcined as it were, and ſplit and ſhattered in Pieces by it, and afterwards melted into Glaſs. This, however, was probably a Kind of Fire, unknown in theſe extreme Degrees of Power, till very long after the Time of this Author. The culinary Fire, or that uſed in thoſe Times for fluxing Ores, the ſtrongeſt they then knew, tho' much leſs intenſe than thoſe we now uſe on that Occaſion (of which there are many unqueſtionable Proofs; nay, that even thoſe of the Workers in Metals, but a few Ages ago were ſo) had no Power of making any Change in theſe Stones; therefore the Author is not to be cenſured for eſteeming them incombuſtible; or not knowing what it was impoſſible he ſhould have ſeen. He is to be underſtood with regard to the Action of the Fires uſed in his Time; and he muſt then be allowed to have been well acquainted with the Subjects he treats of in this Diviſion of his Work.

[x] The Antients expreſſed by this Word all

This is called the [x] Carbuncle, on which

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the red tranſparent Gems, which have been ſince diſtinguiſhed under the Names of the different Kinds of Ruby, Granate, Hyacynth, *&c.* all which they eſteemed only different Species of the Carbuncle: And in Juſtification of them it muſt be acknowledged, that foſſile Bodies not being organized, in general want thoſe fixt and determinate Characteriſtics, by which thoſe of the vegetable and animal Kingdoms are unalterably diſtinguiſhed from each other. Thoſe of the Gems in particular have fewer fixed and unvariable Differences by which their Genera and Species may be determinately fixed than any other.

The Reaſon of the Difficulty in regularly methodizing and diſtinguiſhing the Genera and ſubordinate Species in the various Claſſes of the foſſile Kingdom, is, that in the Time of their original Concretions their Particles ſcarce ever coaleſced in perfect Purity; but took up among them, from amidſt the Maſs of fluid Matter in which they were at that Time ſuſtained, Particles of extraneous Matter, of various Kinds in various Places; ſo that not only the external Face, but even the interior Conſtitution of the ſame Species is found in different Regions very different; and in many Specimens not to be known at firſt ſight even to the moſt accurate Obſerver.

γλύφουσιν. ἐρυθρὸν μὲν τῷ χρώματι,

But if this be the Caſe in foſſile Subſtances in general, it is much more particularly ſo in this Claſs of them, the Gems; the Differences of which are owing to the Diſtribution of a certain kind of Particles in their Maſſes; which are ſo very uncertain, both in Quantity and Manner of placing, and in their various Effects upon the Maſs, that ſcarce any thing abſolute is to be determined from them.

The Gems are naturally angular, as are the Cryſtals: but like them, from various Accidents in their Formation, they are found ſometimes in rude or ſhapeleſs Maſſes; and when angular, they have ſtill all that Variation of Figure which we ſee take place in Cryſtal and Spar; from the different Diſturbances of their Cryſtalization. In all theſe Caſes a various Number of Angles may be occaſioned, as we ſee in Salts, from the Accidents of their Concretion. In theſe, as well as in thoſe, we have the ſame Kind in different Figures; and as we can cryſtalize them under the Eye, we can determine the Cauſes of thoſe Alterations. The round, or pebble Gems, ſeem not to have been original in that Form, but worn to it by rolling about in a Fluid.

The Hardneſs and the Luſtre of the Gems, muſt diſtinguiſh them from all other Stones; for if we conſidered their Form, as their eſſential Character, many Cryſtals would aſſume the they engrave Seals. Its colour is red,

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Name: and *Cronſtedt* has well determined, that a certain Spar he had ſeen in Figure of the moſt regular Diamond, muſt then be called, a Diamond.

No peculiar Conſtruction, no Form of conſtituent Parts is viſible in the Gems: they appear as Maſſes of uniform Nature; and they break irregularly and indeterminately; yet there is in all a really plated Structure. The Lapidaries find this in ſome, and can ſplit them; the Burning Glaſs diſcovers it in the reſt; and when turned to it in a right Direction, tears them to pieces: they ſplit into the thinneſt Plates that can be conceived, and ſeem to have been compoſed in the Manner of the Talcs, only more compact. 'Tis pity this Character is not more obvious: for it affords a real diſtinctive Mark between the Gems, and all other Stones: Cryſtals, which ſeem to come neareſt to them, have it not.

Their Colours are leſs eſſential, for they can in moſt be driven away by Fire; and Nature ſometimes gives the Gem without them; they are evidently owing to the Metals; for we can by means of Metals, give the ſame to Glaſs; our artificial Gem.

The Salt Syſtem of *Linnæus* appears here almoſt ludicrous. To a truly philoſophic Eye, the Difference of Eſtimation and Price are nothing; but the common Reader will hardly keep his Countenance when he ſees the Diamond reduced to a Species of Allum; and the Emerald of Borax. *Foſſils Arrang'd*, p. 137, 138.

What can be aſcertained in general is this:

The Maſs of conſtituent Matter in them all, is a pellucid cryſtalline Subſtance, which is in different Kinds of different Degrees of Hardneſs, from that of the Diamond to that of the mereſt ſhattery Cryſtal. This cryſtalline Matter, had it concreted in perfect Purity, had been colourleſs alike in all: and the various Species had been diſtinguiſhable only by their different Degrees of Hardneſs: but as this Matter, in the time of its Coaleſcence, aſſumed into it any Particles of a proper degree of Gravity and Fineneſs, which happened to float in its Way, it became by that Means different not only in Colour, nay, and in Degree of Colour, according to the Nature and Quantity of the Particles it took up into itſelf; but from their different Nature was alſo altered in what alone could have been its determinate Characteriſtics, its Hardneſs and ſpecific Gravity, Many Reaſons may be alledged why the Particles thus aſſumed into the cryſtalline Nodules at the Time of their Formation, muſt have been principally of the metalline Kind; and we find, in effect, that they were ſo. The various Colours of the Gems have their Riſe from theſe Admixtures; and, according to what I have before obſerved as to the colouring of Spars by the ſame Means, when the metalline Matter thus mixed with the cryſtalline was Lead, the Stone became a Topaz, or, as the Antients called it, a Chryſolite: for it is very evident, that what they called the Topaz, we now call the Chryſolite; and what they called the Chryſolite, we now, on the contrary, call the Topaz.

Our Topaz is a very elegant and very beautiful Gem, of which the Jewellers have two Kinds, the Oriental and Occidental; the Oriental are of a fine pale yellow like the Jonquil Flower. They are of very great Splendour, and equal the Ruby in Hardneſs. Theſe are brought from *Arabia*, and many Parts of the *Eaſt Indies*. The Occidental are often very beautiful; but are diſtinguiſhed from the Oriental by their Softneſs, for they are no harder than common Cryſtal: and by a foxy redneſs with the yellow. We have them from *Sileſia* and *Bohemia*.

The Topaz of the Antients, now called the Chryſolite, differs from theſe in Colour, for it has always an Admixture of green with the yellow; probably from Particles of Copper diſſolved in an Acid, and taken up with thoſe of the Lead into the Matter of the Gem, at the Time of its original Concretion.

As theſe Gems have their Colours from this accidental Admixture of extraneous Particles, they may alſo be diveſted of them by Fire; without any Injury to their Texture: and the Oriental Topaz thus rendered colourleſs, is, like ſome other Gems to be hereafter deſcribed, ſometimes made to counterfeit a Diamond.

πρὸς δὲ τὸν [y] ἥλιον τιθέμενον, ἄνθρακος καιομένου ϖοιεῖ χρόαν. Τιμιώτατον δ' ὡς εἰπεῖν. μίκρον γὰρ σφόδρα, τετταράκοντα χρυσῶν. ἄγεται δ' οὗτος ἐκ Καρχηδόνος ϗ Μασσαλίας.

When Lead and Iron together entered the Compoſition, the Stone became a Hyacynth; when Iron alone, the Granate, and other red Gems, or, as the Antients in one Word expreſs it, the Carbuncles were produced: the Ruby is particular, and owes its dye to Gold. When Copper, diſſolved by Acids got in, the Emerald appeared; by Alcalies, the Sapphire; and ſo of the reſt. No Wonder is it, therefore, that the Gems in particular have never been perfectly reduced to Method; ſince there is ſo little Room for determining any thing fixed and ſtable in regard to them; and when the Operations by which Nature gave them their Exiſtence, have been ſo uncertain, and liable to ſuch numberleſs accidental Variations.

[y] It was from this Property of reſembling a burning Coal when held againſt the Sun, that this Stone obtained the Names *Carbunculus* and ἄνθραξ; which afterwards being miſunderſtood, there grew an Opinion of its having the Qualities of a burning Coal, and ſhining in the dark: and as no Gem ever was, or ever will be found

and of ſuch a Kind, that when held againſt the [y] Sun, it reſembles that of a burning Coal. This Stone is extremely valuable, one of a very ſmall Size being valued at forty Aurei. It is brought from *Carthage* and *Maſſilia.*

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endued with that Quality, it was ſuppoſed that the true Carbuncle of the Antients was loſt: but it was long generally believed, that there had ſome time been ſuch a Stone. The Words of this Author, however, ſet it very clear, that this Appearance in the Sun only was the Occaſion of the Name. That Species of Carbuncle of the Antients which poſſeſſed this Quality in the greateſt Degree, was the *Garamantine* or *Carthaginian*; and as the Author gives alſo *Carthage* for the Place whence this which he here deſcribes was brought, there is no doubt but the particular Species here meant, is the *Garamantine* Carbuncle of the Antients, and that is the true Garnet of the Moderns. Experience ſhews, that this Stone has more the Appearance of a fire Coal in the Sun than the Ruby or any other of the red Gems; and it is famous for ſuſtaining the Force of Fire unhurt; which is the other great Characteriſtic of that Stone mentioned by the Author. This Stone is often very beautiful and valuable: I ſaw one ſold this Winter, 1774, at an Auction λϛ΄ Οὐ καίεται δ᾽ ὁ ϖερὶ [z] Μίλητον γωνιειδὴς ὤν. ἐν ᾧπερ ϗ τὰ ἐξάγωνα.

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of Mr. *Chriſtie*'s, under the Name of a Jacinth, for a very conſiderable Sum of Money; and very well it was worth it.

[z] The *Miletian* Kind is generally ſuppoſed to be that called by other Authors the *Alabandine*, as the Places from whence they have their Names are in the ſame Kingdom. *Theophraſtus*, who deſcribes the *Miletian*, has not mentioned the *Alabandine*; and *Pliny*, who deſcribes that, has not named the *Miletian*.

The other Gems, by the Antients included in the general Name Carbuncle, are diſtinguiſhed by later Writers into various Species of the Ruby, Garnet, Almandine, and Hyacynth; and are,

1. The *Rubinus verus*, the True Ruby. This is of a fine blood Colour, and of extreme Hardneſs, and, when large, is by ſome ſtill called a Carbuncle. This is from *Cambaja*, *Calicut*, *Coria*, and the Iſland of *Ceylon*.

2. The Balaſs Ruby, *Rubinus Balaſſius* or *Pallacius*. This is of a paler red than the former, and tinged with a mixture of blue; its common Shape is oblong and pointed. And either this or the Rock Ruby, as it is called,

XXXII. There is alſo an incombuſtible Stone found about *Miletum*[*], which is of an angular Shape, and ſometimes regularly hexangular; they call this alſo

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which is a Species of the Garnet hereafter to be mentioned, is probably the *Carbunculus Amethyſtizontes* of *Pliny*. The Balaſs Ruby comes principally from the Iſland of *Ceylon*.

3. The *Rubinus Spinellus*, the Spinell Ruby. This is of a clearer red than the Balaſs, but is not ſo bright nor hard as the true Ruby.

4. The *Rubacus*, the *Rubacelle*. This is red, with a caſt of yellow, and is the leaſt valuable of all the Kind.

5. The *Granatus verus*, the true Garnet. This is a very beautiful Gem, and was, as before obſerved, the Carbuncle of *Theophraſtus*, and *Carbunculus Garamanticus* of the Antients in general: Its Colour is a deep red, approaching to that of a ripe Mulberry, but held to the Sun, or ſet on a light Foil, a true Fire Colour. This is ſometimes found of a conſiderable Size.

6. The *Granatus Sorranus*, the Sorane Garnet. This is of an intenſe red, but with ſome mixture of yellowiſh, or of the Colour of the Hyacynth of the Moderns.

7. That Species of the Garnet called the Rock Ruby, the *Rubinus rupium*, and by the *Italians Rubino de la Rocca*. This is a very

καλȣ̃σι δ' ἄνθρακα ϗ τȣ̃τον· ὁ ϗ θαυμαϛόν ἐϛίν. ὅμοιον γὰρ τρόπον τινα ϗ τὸ τȣ̃ [a] ἀδάμαντος.

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hard Gem, and is of a fine red, mixed with a violet Colour.

8. The Almandine; a Stone of a middle Nature, between the Ruby and Garnet. This is the *Alabandicus* of *Pliny*, and probably the Mileſian Carbuncle of our Author already deſcribed.

9. The Amandine. This was the *Træzenius* of the Antients, and was variegated with red and white; but is at preſent ſcarce known.

10. The *Sandaſtrum* of *Pliny*, a Gem now wholly loſt.

11. The Hyacynth of the Antients; truly and properly a violet-coloured Gem, and which, if it be now at all known, is ranked by the Moderns among the Amethyſts. The Stones we know by the Name of Hyacynths, being Gems of a yellowiſh red in three or four Degrees, which will be more particularly ſpoken of hereafter.

[a] The Diamond has been thought to come neareſt of all Gems to deſerving the Character of incombuſtible. It will bear extreme Degrees of common Fire, and that for a long Time together, and come out unhurt. But it

a Carbuncle from its not being injured by the Fire; but that is ſtrange, for the Diamond [a] might as properly be for that Reaſon called by the ſame Name, as it alſo poſſeſſes that Quality.

ſuffers ſome Damage, if ſuddenly brought into the Cold after theſe ſevere Trials; and much more by the Burning Glaſs. But there is yet a Quality which the Diamond ſhews in the Fire different from all other Gems, and by which it is diſtinguiſhed from them all; for there is a certain degree of Fire in which it is volatile. I ſhewed this, very many Years ago, to the late Excellent Lord *Granard* and Mr. *Charles Stanhope*, at my Houſe in *Bloomſbury*; by placing a ſmall Diamond in a wind Furnace. We ſaw the Progreſs of the Operation: the Diamond was firſt penetrated by the Fire throughout its whole Subſtance; and appeared a burning Coal: it then ſhivered and cracked in many places, and afterwards became ſmaller and ſmaller till it entirely vaniſhed: no Part nor Remnant of it was to be found.

The Diamond is the hardeſt and moſt reſplendent of all Gems, and has in all Ages been eſteemed much more valuable than all others: its Colour, when pure, as it generally is, is that of perfectly clear Water; but it is ſometimes found tinged with metalline Parλγ΄. Οὐ γὰρ οὐδ' ὥσπερ ἡ κίττηρις ϗ τέφρα, δόξειεν ἂν, διὰ τὸ μηδὲν

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ticles, aſſumed into it at the Time of its original Formation, as in the other Gems; and is thence yellowiſh, reddiſh, or bluiſh, and ſometimes, but very rarely, greeniſh. As the Diamond thus is ſometimes of the Colour of other Gems, but greatly ſuperior in Hardneſs to them; ſo the common Cryſtal, ſometimes, from the ſame Accidents, reſembles them, and is much ſofter, and of little Value. Cryſtals thus tinged are what the Jewellers call Baſtard Emeralds, Sapphires, *&c.*

The Diamond is compoſed of various Laminæ laid cloſe one on another; and Jewellers of Skill will ſometimes find the Joinings, and with the Edge of a fine Inſtrument ſplit a Diamond into two of equal apparent Surfaces.

If the plain Surfaces of the Plates of a Diamond be turned to the Focus of the ſtrongeſt Burning-glaſs, it receives no Hurt, even by that powerful Fire; but if the Edges and Joinings of the Laminæ are turned to it, the Stone ſeparates at them, is reduced into a number of Scales or thin Flakes; and loſt.

The Form of the *Brazil* Diamond differs from the Oriental, as well as do its Qualities. There are Shirly, or Baſaltine, reſemblances of all the Oriental Gems; and this is

XXXIII. The Power theſe Stones have of reſiſting the Force of Fire; is not from the ſame Cauſe with that of

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ſuch of the Diamond; and no other. *De Laet* was acquainted with it, and with its qualities. *Agricola* knew its Dodecahædral form. *Wallerius* accurately deſcribes its Faces by their cubic Shape. The *Brazil* Diamond has the ſame Electric, and the ſame Phoſphoric Properties, with the Oriental: After it has been held in the Sun, it has a ſilvery Brightneſs in the dark; and the ſame Quality, in ſome Degree, when rubbed: and it takes the Foil, as the Oriental Diamond. But they all want the perfect Hardneſs of the Oriental Diamond; and they have ſomewhat leſs ſpecific gravity; and they can be melted by the extream force of Fire, which the Oriental Diamond cannot.

We are not to expect all Diamonds in their perfect cryſtalized form; we ſee them rounded in the Manner of the pebble Cryſtals, and like all other cryſtalized Stones, they vary in the Number of the Angles, even in the ſame Species.

Like all the other cryſtalline Stones, this is alſo liable to be tinged to all Colours; but theſe Tinges it receives in ſo ſmall a Quantity, and in a Degree ſo delicate, that it is a Doubt ἔχειν ὑγρόν. [b] Ταῦτα γὰρ ἄκαυστα ϗ ἀπύρωτα, διὰ τὸ ἐξηρῆσθαι τὸ ὑγρόν.

λδ΄. Ἐπεὶ ϗ τὸ ὅλον ἡ κίσσηρις ἐκ κατακαύσεως δοκεῖ τισι γίνεσθαι. πλὴν

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whether a coloured Diamond be not more beautiful even than a perfect clear one.

We talk of our vaſt Diamonds, the *Tuſcan*, the *Sancy*, and *Pitt*'s; but what are theſe to that of the *Mogul*, which before cutting weighed very near eight hundred Carats? *Foſſils arrang'd, p.* 139, 140.

[b] The Author here explains upon the Manner in which theſe Stones reſiſt the Action of the Fire, which he declares to be by their containing naturally no Moiſture, which he has before declared to be eſſential to Fuſibility; not by their having already ſuffered all the Change they were liable to, from their having been before expoſed to that Element. He gives the very rational Opinion of ſome People in his Time, and which we ſhall eaſily perceive hereafter was alſo his own, that ſome Subſtances, commonly ſuppoſed in their native State, had certainly been wrought upon by Fire; and had by that means been diveſted of whatever that Element could drive out of them:

the Pumices, or of Aſhes [b]. They ſeem not to burn, becauſe they abſolutely and originally contain no Moiſture; whereas thoſe Subſtances do not kindle nor burn in the Fire, becauſe their Humidity has been already evaporated.

XXXIV. Some are of opinion, that the [c] Pumices have been entirely made

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and brought into a Condition of not ſuffering any farther Changes by the ſame Means.

[c] The Author mentioning it but as the Opinion of ſome, that the Pumice had already paſſed the Fire, and by it been reduced into its preſent State; is a Proof that the general Opinion in his Time was, that it was in its native Condition. This ſeems to have been an Error of the later as well as the antient Writers of Foſſils, who have almoſt all given it a Place among the native foſſil Stones, as if Nature had formed it as we ſee it: Whereas there is all the Evidence that our Senſes can give, that it is no more than a Cinder; the Remainder of ſome other foſſile Body calcined by a violent Fire either ſubterranean unſeen, and perhaps ſince extinguiſhed, or that of the burning Mountains, on and about all which it is conſtantly found; and that in vaſt Quantities. The more violent Exploſions of theſe may have toſſed immenſe Quantities of it to Places ſo diſ-

τῆς ἐκ τοῦ ἀφροῦ τῆς θαλάσσης συνισταμένης· λαμβάνουσί δὲ τὴν πίστιν διὰ τῆς αἰσθήσεως.

λέ. Ἔκ τε τῶν περὶ τοὺς [d] Κρατῆρας

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tant, as to make People forget its coming thence; or into Seas, whoſe Tides and Storms may have carried them to other Shores, near which no ſuch Repoſitories of it are ſituated; and this might yet more puzzle and miſlead People about its Origin. The great Quantities of Pumices found in this Manner, far from any Fires by which they might have been formed; floating on the Surface of the Sea, thus thrown on it, or perhaps raiſed by the burſting of Vulcanos from its Bottom; and ſomething altered from their original Figure and Colour, by being waſhed and rounded by the Motion of the Waves, gave Riſe to an Opinion in ſome, that ſuch were another Kind, different from thoſe of the burning Mountains; and that they were formed by a Concretion of the Froth of the Sea: in this, as the Author obſerves, they had the apparent Teſtimony of their Senſes. Many have erroneouſly imagined, that by this Kind, ſuppoſed by ſome to what they are by burning; that Kind excepted which they eſteem formed by the Concretion of the Froth of the Sea: This Opinion, as to the Sea kind, they take from the apparent Teſtimony of their Senſes.

XXXV. As alſo the other, in regard to thoſe formed in the [d] Mouths, and

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be formed of the Froth of the Sea, this Author meant the *Alcyonium*; and have fallen foul upon him for ranking that Subſtance among the Pumices: But no one has done him more Injuſtice in this point than his Editor *De Laet*, who, though in his Edition of this Author he does Honour to *Furlanus*, for having juſtified him in that point, and obſerved that this was not his Meaning; yet afterwards, in his own Hiſtory of Gems, *&c.* charges him with it, *L.* 2. *p.* 131. *Theophraſtus etiam alcyonium, quod ex maris ſpuma concreſcat, Pumicem vocat.*

[d] For theſe there is, indeed, the apparent and unqueſtionable Teſtimony of our Senſes, that they owe their preſent Mode of Exiſtence to the Action of Fire, ſcarce any foſſile Subſtance being of Strength and Solidity enough to bear the exceſſive Degree of it in theſe Places, without being affected and altered in its Form; and reduced to a Slag or Cinder of ſuch Kind

γενομένων, ϗ ἐκ τῆς Ἀραβικȣ̃ λίθȣ τῆς φλογȣμένης, ἣ ϗ κισσηρȣ̃ται. μαρτυρεῖν δὲ ϗ οἱ τόποι δοκȣ̃σιν ἐν οἷς ἡ γένεσις. ϗ γὰρ

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and Texture as its conſtituent Parts diſpoſed it moſt readily to fall into. As to thoſe found floating on the Sea, I have obſerved how hardly the Author has fared about them in *De Laet*'s Hands; but *Boetius* has yet infinitely more puzzled this Cauſe in regard to him, and ſeems even to have miſunderſtood the Miſunderſtandings of others concerning him; for he tells us, *L. 2. p.* 400, ſpeaking of the Pumice in general, *Ἁλκυόνιον a Theophraſto vocari putant, quod e marina ſpuma coactus ſit:* And this is one of the many Inſtances in which this good old Writer is ſo ſtrangely miſrepreſented, that it is impoſſible, from the Accounts of others, to make the leaſt Gueſs at what he has left us. The very Word Ἁλκυόνιον is no where to be found in this whole Book; and what he is generally charged with is, not the calling the Pumice *Alcyonium*, as this Author imagines; but the *Alcyonium a Pumice:* And even that Accuſation, we ſee, from a careful Review of his own Words, is wholly groundleſs and erroneous, different Openings of the burning Mountains, through which the Flames have made their way: and thoſe made by burning the *Lapis* [e] *Arabicus*, a Stone, which when it has paſſed the Fire aſſumes the Form of the Pumice. The

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[e] In the other Editions of this Author there is the Word Διαβάρȣ, where I have given Ἀραβικȣ͂; the former is the Name of no Stone in the World, and the latter of one very aptly placed in this Claſs of Foſſils; and which all the Antients have deſcribed, but this Author no where elſe has the Name of: There is therefore no queſtion but that this was the original Reading, and the common Text, Διαβάρȣ, no more than an Error which got early into the Copies, and has been ever ſince (as Errors uſually are) carefully and exactly preſerved. This is alſo the Opinion of *De Laet*, who, however careleſs of this Author in his *Liber de Gemmis*, yet is a thoughtful and good Critic on him in many Places in his Edition of this Treatiſe.

This *Arabicus*, or, as it is ſometimes called, *Arabus Lapis*, is deſcribed alſo by *Dioſcorides*, *Pliny*, *Iſidorus*, &c. as a white Stone, reſembling the pureſt Ivory, which when burnt became ſpungy, porous, and friable; in ſhort, aſſumed the Form of the Pumice; and was uſed, like it, as a Dentrifice. *Dioſcorides*, ἐν τοῖς μάλιστα ϗ ἡ κίσσηρις. Τάχα δ᾽ ἡ μὲν οὕτως, οἱ δ᾽ ἄλλως. ϗ πλείους τρόποι τῆς γενέσεως[f].

λϛʹ. Ἡ γὰρ ἐν [e] Νισύρῳ καθάπερ ἐξ

ſpeaking of it, ſays, Ὀδόντων δὲ σμῆγμα γίνεται καυθεὶς κάλλιστον. and Ὁ δὲ Ἀραβικὸς λεγόμενος λιθος ἔοικεν ἐλέφαντος ἀσπέλη. *Pliny*, *Arabicus Lapis Ebori ſimilis dentifriciis accommodatur crematus.* And this was ſo early as in thoſe Times, and even continues yet to be one principal Uſe of all the Pumice Kind.

[f] That all true genuine Pumices are formed by the Action of Fire, I believe, is an unqueſtionable Certainty; but as the antient as well as modern Naturaliſts have often confuſedly placed among them, and under their Names, other Stones of different Kinds, and abſolutely different Origin, though ſomething reſembling them in external Figure, the Author does very judiciouſly here in alloting a different Proceſs of Nature for the Formation of ſuch.

Places, indeed, in which Pumices are produced, ſeem to teſtify the Manner of their Formation; for they are principally found about the Craters of the burning Mountains. On the whole, ſome Kinds of them, perhaps, may be formed by the Action of Fire on Stones of a proper Texture, and others in ſome other Manner: for there are in Nature many different Ways of Production[f].

XXXVI. The Pumices in the Iſland of [g] *Niſuros* ſeem an Inſtance of this, ἄμμου τινὸς ἔοικε συγκεῖσθαι. σημεῖον δὲ λαμβάνουσιν, ὅτι τῶν εὑρισκομένων ἔνιαι διαθρύπτονται ἐν ταῖς χερσὶν ὥσπερ εἰς ἀμμόν, διὰ τὸ μήπω συνιστᾶναι μηδὲ συμπηπεγέναι.

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[g] Theſe Pumices, as they are called, of *Niſuros*, ſeem not only an Inſtance of the different Operations of Nature uſed in the Formation of the different Pumices; but of there having been Stones of wholly different Kinds and Origin ranked among them. The Deſcription the Author gives of them, proves them to be no genuine Pumices, but Tophi; natural and original Nodules, or looſe Maſſes of Matter; covered with a Cruſt, as moſt of the natural Nodules are, but none of the Pumices ever are ſeen to be; nor, indeed, is it eaſy to be conceived, from their manner of Formation, how they ſhould: Theſe were foſſile Subſtances, therefore, of ſome other Claſs, which, as they in a ſuperficial Manner reſembled the Pumice, the indeterminate Man-

λζ'. Εὑρίσκουσι δ' ἀθρόας κατὰ μι-

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ner of writing in thoſe early Times, had given Occaſion to be ranked among them. What they really were is not eaſy, at this diſtance of Time, to determine; but the moſt probable Conjecture is, that they were Pyritæ; Specimens of which I have at this Time, that bear ſome rude external Reſemblance of the Pumice Kind; and we ſhall preſently ſee this Author deſcribing a Pumice, which he ſays is ſomething like one Species of the *Pyritæ*, called *Molaris*; it may give ſome Light into this Caſe to obſerve, that *Strabo*, mentioning this Iſland, ſays, *Saxoſa eſt & molaris lapidis copia prædita.* *De Laet* imagines the Stone deſcribed by our Author muſt have been very different from that of *Strabo*'s, becauſe it was liable to crumble to pieces in the Fingers; but as I have already obſerved, that the Molaris of the Antients was a Species of the *Pyrites*, and as no Stone is ſo liable to crumble in pieces as the *Pyrites*, for they appear to have been ſormed by a ſlight Coaleſcence only of an arenaceous Matter: What is eſteemed a Proof of this is, that ſome of the Pumices found there crumble in the handling into a kind of Sand, as if they never had been thoroughly concreted or bound into a Maſs.

XXXVII. Theſe are found in Heaps,

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when it has lain ſome time expoſed to the Air, and the Salts have ſhot and got looſe, I am ſo far from being of his Opinion, that I look upon it as a Certainty, that the Niſura Pumice of our Author, and Molaris of *Strabo*, are the very ſame Subſtance; and that *Strabo*'s Words are a great Confirmation of my Conjecture; as is alſo the Size our Author allots the Stone, and its Property of crumbling in pieces, which he alſo obſerves was not univerſal, but only happened to ſome of them, thoſe, I imagine, which had lain moſt expoſed, and the Salts of which had been let looſe by the Humidity of the Air, while the others continued firm and ſolid, as thoſe in *England* and other Places do, while lodged in the Strata they were originally depoſited amongſt. This I take to have been the Occaſion of the different Degrees of Hardneſs of this Subſtance which our Author has deſcribed, though the Philoſophy of his Times κρὰ χειροπληθεῖς ὅσον πολλὰς, ἢ μικρῷ μείζους, ὅταν ἀπαμείρωνται τ᾽ ἄνω.

λή. Ἐλαφρὰ δὲ σφόδρα ϗ[h] ἀμμώδης ἐν Μήλῳ πᾶσα μὲν, ἐνία δ᾽ αὖ ἐν λίθῳ τινὶ ἑτέρῳ γινεται, καθάπερ ἐλέχθη πρότερον.

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had not looked far enough into Nature to ſee the Cauſe.

[h] The beginning of this Sentence appears to have been always hitherto faultily printed in the Editions which have come to our Knowledge; the Honour of ſetting it right, by the Emendation according to which I have given it, belongs to *De Laet*; whom it is much more Pleaſure to me to name thus with Reſpect than Cenſure; though an earneſt Deſire of doing the Author Juſtice, and finding his true Meaning, the only End I have in view in theſe Annotations on him, ſometimes obliges me to ſpeak in that manner. What is here καὶ ἀμμώδης, is in the other Editions ἢ καὶ ἄμμος; which, as Sand was not the Subſtance here treated of, could never have been the original Reading.

The Iſland of *Melos*, ſometime called alſo *Mimalis*, has been always known to abound many of them at leaſt as big as can be graſped in a Man's Hand, and ſometimes larger than that, when the ſuperficial Part is taken off.

XXXVIII. All the Pumices of the Iſland of *Melos* are alſo light and [h] ſandy; and ſome Kinds there are which are produced, as was before obſerved, in other Stones.

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with Pumices, and thoſe of the very fineſt Kind; which it did alſo in this Author's Time, as appears by his Deſcription of their being light and ſandy, or eaſily rubbed to Powder; from which laſt Quality, poſſeſſed in ſome Circumſtances in a much greater degree, it was principally, I ſuppoſe, that the *Pyritæ* of *Niſuros* obtained the Name of Pumice: As from ſome like Similitude of Subſtances did the Stones next mentioned here under the Pumice Name, and ſaid to be produced in other Stones; and which, whatever they were, as it is not eaſy at this diſtance of Time, and with the little Light we have from the Writings of the Antients, to aſcertain, I am perfectly convinced, however, from the Account of their being found in other Stone, and that as we cannot but conclude from the Detail, unaltered in its own Texture, were no genuine Pumices.

The Differences afterwards aſſigned to the

λθ´. Διαφορὰς δ᾽ ἔχȣσιν ϖρὸς ἀλλήλας, ϗ χρώματι, ϗ ϖυκνότητι, ϗ βάρει.

μ´. Χρώματι μὲν ὅτε μέλαινα, ἐκ τȣ̃ ῥύακος, τȣ̃ ἐν Σικελίᾳ. ϖυκνός τε ϗ βαρεῖα, αὐτή τε ϗ μυλώδης. γίνεται γάρ τις ϗ τοιαύτη κίσσηρις, ϗ βάρος ἔχει, ϗ ϖυκνότητα, ϗ ἐν τῇ χρήσει ϖολυτιμότερον τῆς ἑτέρας. σμηκτικὴ δὲ ϗ ἡ ἐκ τȣ̃ ῥύακος μᾶλλον τῆς κȣφῆς ϗ λευκῆς. σμηκτικωτάτη δ᾽ ἐκ τῆς θαλάσσης αὐτῆς.

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different Species of the Pumice, are what may be obſerved in a greater or leſſer degree in the various Kinds we now have brought from *Germany*, the *Eaſt Indies*, and the burning Mountains; and the Author appears to have been very well acquainted with them: His aſſigning a greater Degree of the abſtergent Quality to that from the Shores than that from the burning Mountains; and a greater than even in that, to thoſe of the Sea, is probably very juſt, though not now regarded, as the Sea Salt in-

XXXIX. The different Sorts alſo vary from one another in Colour, Compactneſs, and Gravity.

XL. As to their Colour, there is a black Kind found on the *Sicilian* Shores, which is compact and weighty, and ſomething reſembles that kind of the Pyrites called the *Molaris*: for there is a natural Pumice of this Texture, heavy and compact; and this is of more Value and more uſeful than many of the others; this Kind from the Shores is a better Abſtergent than the light white Kind: But the moſt abſtergent of all others, is that from the Sea itſelf.

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corporated in the Maſs of thoſe, muſt add much to this Quality.

The Author having now gone through the Nature of the Pumices, returns to the Conſideration of thoſe Stones he was before deſcribing, and from the Hiſtory of which he had looked on this as a Digreſſion. The Stones here treated of, are what he has before named among the Gem Kind, as I have already obſerved in regard to the Senſe of the Word σφραγίδιον; ſome of the Species of which he

μά. Καὶ ϖερὶ μὲν τῆς κισσήριδος ἐπὶ τοσοῦτον εἰρήσθω. ϖερὶ δὲ τῶν ϖυρουμένων ϗ τῶν ἀπυρώτων λίθων, ἀφ' ὧν ϗ εἰς τοῦτο ἐξέβημεν, ἐν ἄλλοις θεωρητέον τὰς αἰτίας.

λϐʹ. Τῶν δὲ λίθων ϗ ἄλλαι κατὰ τὰς ἰδιότητας διαφοραὶ τυγχάνουσιν, ἐξ ὧν ϗ τὰ σφραγίδια γλύφουσιν.

μγʹ. Αἱ μὲν τῇ ὄψει μόνον; οἷον τὸ

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obſerves differ only in their external Figures and Colours, and others in more peculiar Qualities.

[i] The Carnelian is one of the ſemipellucid Gems, and has its Name *Carneolus*, *Carniolus*, or, as it is ſometimes improperly written, *Corniolus*, from its Colour, which, in the different Degrees in various Kinds, reſembles Fleſh with more or leſs of the Blood in it; and *Sardus* or *Sarda*, from *Sardinia*, the Place where it was originally found. The ſeveral Kinds of this Stone are found in different Places, and our

XLI. Hitherto has the Pumice been treated of: Hereafter are to be conſidered the Natures and Cauſes of the Diverſity of the other ſeveral Kinds of combuſtible and incombuſtible Stones; from the Hiſtory of which this Digreſſion has been made.

XLII. There are, beſide what has been already named, among the Stones which are cut as Gems, other Differences, in regard to their ſeveral peculiar Qualities.

XLIII. Some of which are in the external Appearance only. Of this Kind are thoſe of the [i] Carnelian, the

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Lapidaries make a great Diſtinction between the Oriental and Occidental, which differ extremely in Hardneſs. The Antients divided this, as they did alſo other Gems, into Male and Female (as will be ſeen hereafter in this Author) in regard to their deeper or paler Colour; both which Colours, however, are ſometimes found in different Parts of the ſame Stone. The Jewellers of our time reckon four Species of Carnelian; the common or red, the white, the yellow, and the Beryll Carnelian; the firſt of theſe is again divided into Male and Female, Σάρδιον, καὶ ἡ Ἴασπις [k], καὶ ἡ Σάπφει-

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and is much in eſteem for Seals; we have it from the *Eaſt Indies*, as alſo from *Bohemia*, *Sileſia*, *Sardinia*, and many other Places; nor is our own Kingdom without it, though I have never yet found any here perfectly fine. The white is a very beautiful Stone, of a fine Grain, and equal Hardneſs, with many Kinds of the red: it is not perfectly white, but rather what we call a Pearl Colour, white with a ſlight Admixture of blue. The yellow is a very beautiful Stone, often of a fine Flame Colour, and more tranſparent than either of the former; this is found in the *Eaſt Indies* and *Bohemia* only. The laſt, or Beryll Carnelian, is properly the Male Oriental Kind; it is of a deeper Colour than any of the others, as alſo much harder, and more tranſparent: Some of our Jewellers, knowing of no other Beryll but this, name it ſimply the Beryll; but it ought never to be ſo called but with the Addition of its own proper Name Carnelian. The Beryll of the Antients was a Stone of quite another Kind, tranſparent, and of a bluiſh green; and evidently the very Gem which we now call the *Aqua Marina*. Beſides thoſe above named, we have three leſs perfect Carnelians, yet beautiful enough; the brown, which is the *Carneolus Fuſcus* of *Cronſtedt*; the dotted, the *Carneolus Stigmitas* of *Wallerius*; and the

[k] Jaſper, and the Sapphire; which laſt

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veiny *Carneolus Lineatus* of the ſame Author. This laſt I have lately ſeen very beautiful from *Scotland*, ſcarce inferior to the *Eaſt Indian*. *See Foſſils Arrang'd*, p. 209.

[k] The Jaſper is another of the ſemipellucid Stones; it is much of the ſame Grain and Texture with the Agates, but not ſo hard, or capable of ſo elegant a Poliſh, nor does it approach ſo near Tranſparency; its general Colour is green, but it is ſpotted or clouded with ſeveral others, as yellow, blue, brown, red, and white. It is found both in the *Eaſt* and *Weſt Indies*, in *Bohemia*, in many Parts of *Germany*, and in *England*: I have a Specimen of it found here, little inferior to the Oriental, and better than any I ever ſaw from *Germany*. Our Lapidaries diſtinguiſh it into the Oriental and Common; and ſubdivide thoſe Differences according to the Colour of the Spots or Veins. The Oriental is much harder, and capable of a much better Poliſh than any of the others; it is of a bluiſh green, and the Veins are generally red.

The *European* or common Jaſpers are of all Degrees of green, and variegated with ſeveral Colours; the *Engliſh*, in particular, are hard, commonly of a deep green, often not veined or ſpotted at all, and when they are, it is commonly with red or fleſh Colour, ſometimes with ρος[1]. αὕτη δ' ἐστὶν ὥσπερ χρυσόπαστος.

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white, and ſometimes with both thoſe Colours.

The Heliotrope, or common Blood-ſtone, is of this Kind alſo, and very little, if really at all, different from the Oriental Jaſper; the Colour is, like that, of a bluiſh green, and the Variegation red, but in Spots rather than Veins, and of a deeper Colour.

[1] The Sapphire of the Antients, here deſcribed, was a Stone very different from the Gem we now know by that Name, and was of the *Cyanus*, or *Lapis Lazuli* Kind; but not as ſome have too haſtily judged, the *Lapis Lazuli* itſelf *.

We ſhall find by what this Author ſays hereafter, that theſe were evidently two different Stones; and indeed *Pliny*, and the reſt of the antient Naturaliſts, if carefully read, will be found to have clearly diſtinguiſhed them; and deſcribed them to be what they really were, different Species of the ſame Genus. They were both mixed Maſſes, both blue, variegated with white, and yellow; but they differed in this, that the *Cyanus* had the yellow Matter, is ſpotted, as it were with Gold.

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* Quam Gemmam Plinius Sapphirum vocat, Cyanus eſt ſeu Lapis Lazuli. *Boet.* 183.

The Sapphirus of *Pliny* is much different from our Sapphire; and his Deſcription anſwers to the *Lapis Lazuli. Woodw. Meth. Foſſ.* 29.

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in form of Duſt, irregularly and confuſedly mixed among the other Matter of the Maſs; whereas the Sapphire was beautifully ſpangled with it, in regular, diſtinct, and ſeparate Spots. Theſe were its greateſt Characteriſtic, and obtained the Stone its conſtant Epithets of χρυσόπαστος and χρυσοστιγής. *Ineſt* (ſays *Pliny*, ſpeaking of the *Cyanus) ei aliquando et aureus pulvis, non qualis in Sapphirinis, Sapphirus enim et aureis punctis collucet*; or, according to *Salmaſius*, *in Sapphiris enim aurum punctis collucet*; and others of the Ancients deſcribing it, have Σάπφειρος λίθος ἔχων σπιλάδας χρυσίου ὡς ἐν στίγμασι; and λίθος ὡραῖος ἔχων σπιλάδας χρυσίου ὡς ἐν στίγμασι.

Upon the Whole, what can be collected from a careful Peruſal of the Antients on this Subject is, that the Stone they knew by the Name of the Sapphire, was an opake, or at beſt but imperfectly tranſparent, Gem, of a fine blue, deeper than that of the *Lapis Lazuli*, and variegated with Veins of a white ſparry Subſtance, and diſtinct ſeparate Spots of a gold Colour.

The Sapphire of the Antients was therefore not only not the ſame with the Gem we now know by that Name; but had not even the leaſt Reſemblance of it: I ſee no Reaſon, however, to conclude from hence, as *Woodward* and ſome others have done, that our Sapphire was unknown to them: it was unqueſtionably of the Number of their tranſparent Gems, though not diſtinguiſhed by a particular generical Name. *De Laet* imagines it was one of the many Kinds they reckoned of the Amethyſt or Hyacinth; but I think it appears much more probably to have been the Gem they called the *Beryllus Aëroides*; as they did, for the ſame Reaſon, their blue Jaſper Ἴασπις ἀερόεσσα. *Pliny* deſcribes the Beryll in general to be (except in Colour) of the Nature of the Emerald, and ſays it was brought from the *Indies*. Their Beryll was what we now call the *Aqua Marina*, a beautiful tranſparent Gem of a bluiſh green; and there is abſolutely no Stone which our Sapphire more nearly reſembles than this; and to which, if it were not allowed a particular generical Name of its own, it could more properly be referred: nor could there, I think, be otherwiſe conceived a better Name for it than ſuch a one as would expreſs, as this did, a tranſparent Stone of a * ſky blue, and (except in Colour) of the Nature of the Emerald.

Our Sapphire is a very elegant, tranſparent Gem, in moſt Species of a beautiful blue, and nearly approaching to the Ruby in Hardneſs. It owes its Colour to Particles of Copper diſſolved in ſome Menſtruum of an alkaline Nature, and, as more or leſs of this cupreous

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* Sereni enim cœli et lucidiſſimi habet colorem. *Boet.*

Matter has entered its original Compoſition, is of a deeper or paler blue, and in the entire Abſence of it, perfectly colourleſs, and reſembling a Diamond.

We have now among the Jewellers, four Species of this Gem: 1. The blue Oriental Sapphire. 2. The white Sapphire. 3. The Water Sapphire. 4. The Milk Sapphire; and beſide theſe there is a fifth, of a baſtard Kind, having a Tinge of green, the *Sapphirus Subviridis* of *Wallerius*.

The firſt, or fine blue Oriental Sapphires, are greatly ſuperior to the Occidental, and are called, in regard to their deeper or paler Colour, Male and Female. We have them from the Iſland of *Ceylon*, and from *Pegu*, *Biſnagar*, *Conanor*, *Calecut*, and ſome other Parts of the *Eaſt Indies*.

The ſecond is brought principally from the ſame Places, and is a true Sapphire, though wholly colourleſs, being of the ſame Hardneſs with the former, and equalling it in Splendor and Tranſparency.

The third is the Occidental Sapphire; theſe we have principally from *Sileſia* and *Bohemia*. They are of different degrees of blue, but never are ſo well coloured as the Oriental, or nearly ſo hard; their conſtituent Matter coming nearer the Texture of common Cryſtal than the gemmeous Subſtance of the true Sapphire.

The fourth, or Milk Sapphire, is the ſofteſt and leaſt valuable of all; this is the *Leuco-Sapphirus* of Authors; it is brought from *Sileſia*,

μθʹ. Ἡ δὲ [m] Σμάραγδος, καὶ δυνάμεις τινὰς ἔχει. τοῦ τε γὰρ ὕδατος, ὥσπερ εἴπωμεν, ἐξομοιοῦται τὴν χρόαν ἑαυτῇ, μετρία μὲν οὖσα ἐλάττονος, ἡ δὲ μεγίστη, ϖάντος· ἡ δὲ χειρίστη, τοῦ καθ' αὑτὴν μό-

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Bohemia, and ſome other Places: It is tranſparent, and its Colour is that of Milk, with a ſlight Tinge of blue.

The greeniſh Sapphire is from *Bohemia*.

The Oriental Sapphire will loſe its Colour in the Fire, without any Loſs of its Splendor or Tranſparency; and is ſometimes made by this means to counterfeit the Diamond; as the natural colourleſs Sapphire is alſo often made to do: but tho' theſe are both very beautiful Stones, they want much of the Hardneſs and Brilliancy of that Gem, and may always be eaſily diſcovered by a ſkilful Eye.

[m] The Emerald is a moſt beautiful Gem, tranſparent, and of a lively graſs green, without the leaſt Admixture of any other Colour. The *Romans* called this the *Neronian* or *Domitianian* Gem; the *Perſians* and *Indians* call it *Pachæ*, and the *Arabians*, *Zamarrut*; from whence it is generally ſuppoſed the Word *Smaragdus* is derived: though, in my Opinion,

XLIV. [m] The Emerald has alſo its peculiar Properties; for it aſſimilates Water, as was before obſerved, to its own Colour. A Stone of a middling Size will do this to a ſmall Quantity only of the Water into which it is put, a large one to the Whole; but a bad one to no more than a little of it, which lies

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there is much more Probability that that Word was from the *Greek* Verb σμαράσσω, *luceo*, or *ſplendeo*, as this Gem was ever in great Eſteem for its particularly vivid Luſtre. It has its Colour from ſome Particles of Copper diſſolved in an acid Menſtruum, mixed with it at its original Concretion; and it will loſe it, and become colourleſs in the Fire like the Sapphire.

The Antients diſtinguiſhed twelve Kinds of the Emerald, ſome of which ſeem, however, to have been rather Stones of the Praſius or Jaſper Kind, as they talk of Emeralds which were not tranſparent, and of enormous Size; and others no more than coloured Cryſtals and Spars from Copper Mines; ſo that a more ſcientific Way of Writing would probably have much curtailed the Liſt.

The preſent great Diſtinction is into Oriental and Occidental; the former are exceſſively hard, of a lively Colour, and equally beautiful in all Lights. Theſe are of no determinate νον. ϗ ϖρὸς τὰ ὄμματα ἀγαθή. διὸ ϗ τὰ σφραγίδια φορȣ͂σιν ἐξ αὐτῆς, ὥϛε βλέπειν. ἔϛι δὲ σπανία ϗ τὸ μέγεθος

Figure, but generally approaching to a round or oval, the largeſt of them ſeldom coming up to the Size of a Hazel Nut. Theſe are now become very ſcarce, and what we have among the Jewellers may much better be diſtinguiſhed into the *American* and *European*. Of theſe the *American* are greatly ſuperior to the others both in Hardneſs and Luſtre, and are indeed to the *European*, what in moſt other Gems the Oriental are to the Occidental. They are found in many Parts of *South America*, principally in *Peru*. They are often very elegant and beautiful Stones, and ſometimes not inferior to the Oriental in Colour. They exceed all other Emeralds in Size, ſome of them having been found of two Inches Diameter. Nay, there are Accounts of much larger.

The *European* are found in *Germany*, *Italy*, *England*, *Ireland* *, and ſome other Places. They are the leaſt valuable Kind, and are not only inferior to the others in Hardneſs, Colour, and Tranſparency, but alſo in Size.

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* See Dr. *Rutty's* Natural Hiſtory of the County of *Dublin*.

juſt about it. It is alſo good for the Eyes; for which Reaſon People carry about them Seals engraved on it, that they may have them to look on. It is, however, a ſcarce Stone; and but ſmall:

The true Oriental Emerald is of the ſame Hardneſs with the Sapphire: the *American* Emeralds are very different in this reſpect, and really are of different Kinds; ſome of them coming very near the Hardneſs of the Oriental, and others little exceeding that of common Cryſtal; the *European* in general are of this laſt Texture alſo, and, determinately ſpeaking, are rather coloured Cryſtals than real Emeralds.

The Property of the Emerald, of aſſimilating Water to its Colour, here commemorated by this Author, has much puzzled thoſe who have written on theſe Subjects ſince; they have none of them been able to find it in the Emerald, and that for this plain Reaſon, that they have all looked for what the Author never meant: They expected to find, that the Emerald would impart a Tincture or laſting Colour to Water, by being infuſed in it, as vegetable Subſtances, *&c.* do; whereas *Theophraſtus* means no more, than that its Radiations will tinge Water, if it be made the Medium through which they paſs, with their own Colour. This had

οὐ μεγάλη. Πλὴν εἰ ϖιϛεύειν ταῖς ἀναγραφαῖς δεῖ ὑπὲρ τῶν βασιλέων τῶν Αἰγυπτίων, φασὶ γὰρ κομισθῆναί ϖοτ᾽ ἐν δώροις ϖαρὰ τοῦ Βαβυλωνίων βασιλέως· μῆκος μὲν [n] τετράπηχυν, ϖλάτος δὲ τρίπηχυν. ἀνακεῖσθαι δὲ ϗ ἐν τῷ τοῦ Διὸς

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before been obſerved of it in regard to the Air, and it has been ſaid, * *Inficere circa ſe repercuſſum aërem.* Our Author obſerves, that it will do the ſame in Water; and, according to its Size and Goodneſs, diffuſe a Greenneſs through that alſo, if laid in it.

[n] There are, beſide what is here related, many other Accounts of Emeralds of an enormous Size, though none ſo aſtoniſhingly incredible as this: All theſe I imagine to be either abſolutely falſe; Deſcriptions of Things which never had Being: Or erroneous; Accounts of Things which really have been, but have been miſrepreſented through Ignorance or otherwiſe in the relating. Of this laſt Kind I imagine the *Ægyptian* Account to be, and believe that there really were Stones of theſe Shapes and Sizes among them; but that they were not Emeralds, but of ſome other beautiful green Stone, of the Jaſper or ſome like Kind.

* *Pliny*, L. 37. c. 8.

unleſs we are to give Credit to the Commentaries of the *Egyptian* Kings, in which it is recorded, that there was once ſent as a Preſent from a King of *Babylon* an Emerald [n] four Cubits in length, and three in breadth: And that there was in their Temple of *Jupiter*,

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The Antients, in their Accounts of the Emerald, we find, have diſtinguiſhed three Kinds of their twelve, as much ſuperior to the others; theſe were,

1. The *Scythian*, which greatly excelled all the other Kinds, and of which *Pliny* obſerves, that *quantum Smaragdi a gemmis diſtant, tantum Scythici a cæteris Smaragdis.* The Emerald in general was ſometimes, from the particular Excellence of thoſe of this Country, called the *Scythian* Gem, ἡ Σκυθὶς by the *Greeks*, and *Scythis* by the *Latins*.

2. The *Bactrian*, which nearly approached to the *Scythian* in Colour and Hardneſs, but was always ſmall. And

3. The *Ægyptian*, which was dug in the Mountains about *Coptos*. Theſe were ſometimes of conſiderable Size, but of a muddy Colour, and wanted the vivid Luſtre of the two former Kinds.

Theſe were the Characters of the three fineſt ὀβελίσκον ἐκ Σμαράγδων τεττάρων, μῆκος μὲν τετταράκοντα πηχῶν. εὖρος δὲ, τῇ μὲν τέτταρας, τῇ δὲ δύο. Ταῦτα μὲν οὖν ὅτι κατὰ τὴν ἐκείνων γραφήν.

μέ. Τῶν δὲ ° Τανῶν καλουμένων ὑπὸ πολλῶν, ἡ ἐν Τύρῳ μεγίστη. στήλη γὰρ

Species of the Emerald of the Antients; the other nine were, the *Cyprian*, the *Æthiopian*, the *Herminian*, the *Perſian*, the *Attic*, the *Median*, the *Carthaginian*, or, according to ſome of the Critics, *Calchedonian*, for they imagine the Word is miſ-ſpelt *Carchedonii* for *Chalcedonii*, the *Arabian*, called *Cholus*, and the *Laconic*. Theſe were all Emeralds of a lower Claſs than the three firſt named; they were in general found in and about Copper Mines, and were many of them very little deſerving the Name of the Emeralds: They differed in their Degrees of Colour, Hardneſs, Luſtre, and Tranſparency, and the *Perſian*, in particular, was not pellucid. To theſe Species of the Emerald, *Pliny* obſerves, they added the Tanos, a Gem brought from *Perſia*, of an unpleaſing Green, and foul within. From his Manner of mentioning this not among, but after the Species of the Emerald, and ſaying that others gave it a Place among them, an Obeliſk compoſed of four Emeralds, which was forty Cubits long, and in ſome Places four, and in others two Cubits wide. Theſe Accounts we have from their Writings.

XLV. But of thoſe which are commonly called the [o] Tani, the largeſt any where known is in *Tyre*; for there

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it is evident that he did not allow it to be a genuine Emerald.

[o] In the old Editions of this Author there was a ſmall Lacuna after τῶν δὲ, at the End of which was ἀνῶν, the End of the Word wanting. This Defect had been in ſome of the more modern Editions, filled up only with the Letter T, and the Word made Τανῶν; but after Editors, diſſatisfied with this, and obſerving that the Author afterwards mentions the *Bactrian* Emerals, refined upon the former way of filling the Lacuna with a ſingle Letter, and made it Βακτριανῶν, in which Manner it is now generally received by the Critics, and ſtands in almoſt all Editions: I have, however, brought it back to the old Τανῶν again: And this, from what I have to offer in defence of it, I believe cannot but be owned to have been evidently the original Reading. In this I am ſenſible I diſſent from the generality of Critics; and, as in ſome other Places, even

ἐστὶν εὐμεγέθης ἐν τῷ τοῦ Ἡρακλέους ἱερῷ. εἰ μὴ ἄρα ψευδὴς Σμάραγδος. καὶ γὰρ τοιαύτη γίνεται τις φύσις.

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from *Salmaſius*, the beſt, moſt diligent, and accurate of them all, and to whom I am much indebted in many Parts of this Work. But I had rather diſſent from a thouſand Critics than from Reaſon.

That Βακτριανῶν cannot have been the original Reading here is evident, from the Characteriſtics of that Species before named, the principal of which was its Smallneſs. Many of the other Emeralds were at Times found ſmall, but the *Bactrian* always: its general Character was, that it was too ſmall for engraving Seals on, and therefore only uſed for ornamenting Veſſels and other Utenſils of Gold. And it is certain, that if *Theophraſtus* had known this Exception to its common Character, he would have named it hereafter, when deſcribing it, and mentioning ſtill its conſtant Smallneſs. But beſide the Improbability of a large Pillar of a Gem uſually too ſmall for a Seal; why do thoſe Gentlemen imagine *Theophraſtus*, who we ſhall find hereafter was well acquainted with the Stones of this Claſs, ſhould ſuſpect the *Bactrian* Emerald to be a is at that Place a very large Pillar of this Stone in the Temple of *Hercules*. But perhaps this is no true Emerald, but of the *Pſeudo-Smaragdus*; or baſtard Kind; for there is ſuch a Stone of this Claſs.

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baſtard Kind: It was well known to him to be a genuine Emerald, and was generally eſteemed the ſecond in Value: the beſt in the World except the *Scythian*.

That he could never, therefore, mean the *Bactrian* Emerald here, where he is deſcribing a large, and, as he ſuſpects, baſtard Stone, is certain; and that he did mean the Tanus, I think, is, from his Account, almoſt equally clear. He is talking of the exceſſive Size of Emeralds; and after having mentioned two Accounts, neither of which, he tacitly declares, he can believe, he here adds a third, the Truth of which he ſeems not to doubt, but ſuſpects the Genuineneſs of the Stone. *Pliny*, we ſee, is juſt of the ſame Opinion in regard to the Tanus; ranking it, according to the common Opinion, in the ſame Chapter with the Emeralds, but not allowing it a Place among them, according to his own Sentiments. That Author has generally copied cloſely from *Theophraſtus* in Things of this Kind, and almoſt every where adopted his Opinions; 'tis highly probable, therefore, that he had read this Paſμϛ. [p] Γίνεται δὲ ἔν τοῖς ἐν ἐφικτῷ ϗ γνωρίμοις τόποις, διττακȣ̃ μάλιϛα, περὶ

ſage with Τανῶν, and thence formed his Suſpicions of its not deſerving a Place among the genuine Emeralds. And to this it may be added, that *Theophraſtus*, though very particular in his Accounts of the Emerald, and all its Kinds, has no where elſe mentioned this.

[p] After this mention of the Tanus, which the Author ſuſpects to be a baſtard Kind of Emerald, and which was brought from remote Places, he now gives the Hiſtory of the Baſtard Emerald in general; which he obſerves was common, and produced in Places more frequented. What the Antients knew by the Names of Baſtard Gems, were Cryſtals from Mines, tinged with the Colours of the various precious Stones: and that by the ſame means, the Admixture of metalline Particles, at the Time of their original Concretion: Theſe had therefore the Colour, and in ſome degree the Beauty of the Gems, but wanted their vivid Luſtre and their Hardneſs. And thus the Baſtard Emeralds here mentioned were many of them no more than common Cryſtal tinged by Particles of Copper diſſolved in an Acid. But though this was the general and more determinate Senſe of the Words *Pſeudo-Smaragdus*, &c. yet they were often uſed in a

XLVI. p The common baſtard Emeralds are produced in Places known and well frequented; eſpecially in two;

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laxer Senſe, and applied to Subſtances of different kinds more eſſentially diſtinct from the Gem Claſs than theſe, only from their having ſome Reſemblance, (perhaps in ſome Caſes in little more than Colour) to the Gems from which they had the Credit to be named. And of this Kind, if I may be indulged in a random Gueſs, I ſhould imagine this Tanus to have been; which it is evident ſome had placed among the Emeralds, and of which this Author knew not whether he might not refer it to the Baſtard Emerald; though moſt probably it was no more than a fine Jaſper, ranked among theſe Gems by leſs intelligent People, from its having a good green Colour, and ſome degree of Diaphaneity; for I have ſeen Oriental Jaſpers, which, though opake in the Maſs, have been tolerably pellucid, and of a beautiful green, when cut into thin Plates.

The Places where theſe Baſtard Emeralds were found, favour very much the general Account I have given of them. The Copper Mines of *Cyprus* could not but abound in Cryſtals tinged with the Matter of the Mine, and reſembling Emeralds. And *Pliny* obſerves of the *Carthaginian*, that they were always bad, and that the Store of them failed when the

δὲ Κύπρον ἐν τοῖς χαλκωρυχείοις, ϗ ἐν τῇ νήσῳ τῇ ἐπικειμένῃ Καρχηδόνι. ϗ ἰδιωτέρους εὑρίσκουσιν ἐν ταύτῃ. μεταλλεύεται γὰρ ὥσπερ τἄλλα ϗ ἡ φύσις. ϗ ῥάβδους ποιοῦσιν ἐν Κύπρῳ αὐτὴν καθ' αὐτὴν πολλάς· εὑρίσκονται δὲ σπανίαι μέγεθος

Copper Mines there were exhauſted. Copper ſeems, therefore, to have been eſſential to their Formation; and their want of Luſtre and Hardneſs ſhews them not to have been truly Gems, but, what I have before called them, coloured Cryſtals.

Salmaſius is of opinion, that Καρχηδόνι here is an Error, and that the Word ſhould be Χαλχηδόνι; and that the Iſland, the Name of which the Author has not mentioned, was *Demoneſus*, in which there were antiently Copper Mines.

Others are for preſerving the Word as it ſtands, and ſuppoſe the Iſland to be *Cothon* or *Coton*, mentioned by *Strabo*, and placed over againſt *Carthage*. I have every where paid great Deference to that excellent Critic's Opinions; but in this cannot agree with him, becauſe if this be an Error in the Copies of this Author, it is alſo to be amended in *Ariſtotle*, *Pliny*, and the reſt of the Antients, who all have it *Carchedonius*, not *Chalcedonius*: and I ſee no Reaſon why we ſhould doubt but that the Copper Mines of [q] *Cyprus*, and an Iſland over againſt *Carthage*. In this Iſland the true Emerald is alſo ſometimes found. Theſe are dug out of the Earth as the other; and in *Cyprus* there are many Veins of them together;

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there may have been Copper Mines in *Cothon*, though exhauſted or loſt many Ages ſince. There are ſo many Paſſages in the Antients, where theſe Alterations are abſolutely neceſſary, that a Commentator who wiſhes the World to have any Opinion of the Certainty of what they have left us, ought to be very careful how he adds to the Number without apparent Neceſſity.

[q] Theſe were the Emeralds which in after Times were diſtinguiſhed into two Kinds, and made two of the twelve Species they reckoned of this Gem, the *Cyprian* and *Carthaginian*; but it is evident from this Author's Account, that they were really no genuine Emeralds, but are two of the Kinds which a more ſcientific way of writing would have ſtruck off from that Liſt. *Pliny* accounting them Emeralds, we ſee, ſays they were always bad; and *Theophraſtus* tells us, they ſerved as Chryſocolla, for the ſoldering of Gold: and that ſome were of an Opinion, which it is eaſy to ſee he him-

ἔχουσαι σφραγίδος, ἀλλ᾽ ἐλάττους αἱ πολλαί. διὸ ϗ πρὸς τὴν κόλλησιν αὐτῇ χρῶνται τοῦ χρυσίου. κολλᾷ γὰρ ὥσπερ ἡ χρυσοκόλλα. ϗ ἔνιοί γε δὴ ϗ ὑπολαμβάνουσι τὴν αὐτὴν φύσιν εἶναι. ϗ γὰρ τὴν χρόαν παρόμοια τυγχάνουσιν.

μζ. Ἀλλὰ ἡ μὲν [r] χρυσοκόλλα δα-

ſelf alſo favours, that they were of the Chryſocolla Kind; for he adds, they were evidently of the ſame Colour. This Opinion was unqueſtionably very juſt, and theſe Emeralds, as they were called, were no other than a larger, clearer, and purer Kind of Chryſocolla, differing from the common Chryſocolla of thoſe Times in nothing but that they were of a brighter Colour and purer Texture, from there having been leſs of terreſtrial or other heterogene Matter, aſſumed into them at their original Formation. Their anſwering the Purpoſes of Chryſocolla in ſoldering Gold, is alone a ſufficient Proof of the Truth of this, for had they been real Emeralds, or any thing elſe truly of the Gem Kind, they never could have ſerved for ſuch a Uſe.

[r] The preceding Account of the *Cyprian* Emeralds muſt appear very ſtrange to any one who

ſew, however, are found there big enough for Seals to be engraved on: the ſmall ones are very numerous, inſomuch that they uſe them for ſoldering of Gold; which Purpoſe they ſerve in the manner of Chryſocolla. Some have imagined them, indeed, to be of the Chryſocolla Kind, and in Colour they certainly are very like.

XLVII. [f] The Chryſocolla is found

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imagines the Chryſocolla of the Moderns to be the Subſtance with which I here claſs thoſe ſuppoſed Gems: but it is to be obſerved, that the Chryſocolla of the Antients here mentioned, and meant in that Account, was a Subſtance very different from, and indeed not at all reſembling what is at preſent known by that Name.

Our Borax, which we call Chryſocolla for the ſame Reaſon which obtained the original Chryſocolla its Name; its Uſe in ſoldering Gold; is a Subſtance which reſembles that of the Antients in no one thing but that Property; and is a Salt, made by the Evaporation of an ill-taſted and foul Water, of which there are Springs in *Perſia*, *Muſcovy*, and *Tartary*.

The Chryſocolla of this Author, and of the Antients, was a ſparry Matter, of a beautiful green Colour, found in Copper Mines; or if ψιλῆς ϗ ἐν τοῖς χρυσείοις, ϗ ἔτι μᾶλλον ἐν τοῖς χαλκωρυκείοις, ὥσπερ ἐν τοῖς περὶ τȣ̀ς τόπȣς.

μή. Ἡ δὲ Σμάραγδος σπανία, καθάπερ ἔιρηται. δοκεῖ γὰρ ἐκ τῆς [f] Ἰάσπιδος

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in thoſe of other Metals, no where but where there was an Admixture of Copper with the Metal of the Mine. It owed its Colour, as the green Cryſtals and Emeralds do, to that Metal, and was generally found in form of Sand; but if embodied in Maſſes of other Matter, was always ſeparable by waſhing or other Means; and when ſeparated, appeared looſe and in the ſame Form. It was in different Places of different degrees of Colour, but the deeper coloured, and ſuch as reſembled the Emerald, was the moſt eſteemed. It is deſcribed by *Dioſcorides* and *Pliny* to be *coloris herbæ ſegetis læte virentis*, and *porracei coloris*; which is exactly what the *Greeks* called πράσινος. And *Dioſcorides*, in another Place, ſays, the beſt Chryſocolla was that which was κατακόρως πρασιζȣσαν, *ſatiatè porraceum*. The Chryſocolla of the Antients was therefore very different from that of the Moderns: and was what, in a purer State, and larger Size, might in thoſe Times very naturally be, and really was, accounted a Species of the Emerald.

[f] The Jaſper is often the Matrix of the Pra-

in great Quantity in Gold Mines; and even much more plentifully in thoſe of Copper, and the Places near them.

XLVIII. The true Emerald is, as before obſerved, a ſcarce Stone; it ſeems to be [f] produced from the Jaſper, for it

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ſius, and that of the Emerald: this latter is often called the Root or Mother of the Emerald, as that Gem is ſometimes found adhering to it: And, indeed, there are often Parts of the Praſius, which, when cut, are not diſtinguiſhable from genuine Emeralds. The Jaſper itſelf alſo often emulates the Colour and Appearance of the Praſius and Emerald. Indeed when we conſider what has already been obſerved, in regard to the original Formation of Gems, we cannot wonder if they are often found degenerating in Appearance, or improving into, and much oftener affixed upon, or in ſome meaſure blended with the Subſtance of one another. What the particular Stone here mentioned by the Author was, it is not eaſy to aſcertain; perhaps ſome Stone, which they improperly reckoned among the Emeralds; perhaps a Praſius, clearer than ordinary, affixed to a Jaſper, as it frequently is, as well as to Cryſtals and other Subſtances; perhaps no more than a Jaſper, finer than ordinary at one End; for it was often found in thoſe Times green and pellucid; *viret & ſæpe tranſlucet*

γίνεσθαι. φασὶ γὰρ ἑυρεθῆναι ποτὶ ἐν Κύπρῳ λίθον, ἧς τὸ μὲν ἥμισυ Σμάραγδος ἦν, τὸ ἥμισυ δὲ Ἴασπις· ὡς οὔπω μεταβεβληκυίας ἀπὸ τοῦ ὕδατος.

μθ΄. Ἔϛι δέ τις αὐτῆς ἐργασία πρὸς τὸ λαμπρόν. ἀρχῇ γὰρ οὖσα οὐ λαμπρά.

ν΄. Αὕτη τε δὴ περιττὴ τῇ δυνάμει,

Jaſpis, ſays *Pliny*, *l.* 38. *c.* 9. and poſſibly a true genuine Emerald affixed to it, as often to the Praſius, and affixed to, or immerſed in others: But, whatever it was, it is certain, from the preſent more rational Syſtem of the Origin of the Gem Claſs, that it had been in this mixed State from the Time of its original Concretion; and would aſſuredly have for ever continued ſo: there being no Agent in nature of Power to have changed the Jaſper Part into the Nature of the other.

The medicinal Virtues of the Emerald, according to the Antients, were ſo many, that, to look over their Accounts of them, one would imagine it deſerved even more Eſteem as a Medicine than as a Gem: They accounted it a certain Remedy, taken internally in Powder, for Poiſons, and the Bites of venomous Beaſts, for Fluxes of the Belly, the Plague, and peſtiis ſaid there has been found in *Cyprus* a Stone, the one half of which was Emerald and the other Jaſper, as not yet changed.

XLIX. There is ſome Workmanſhip required to bring the Emerald to its Luſtre, for originally it is not ſo bright.

L. It is, however, excellent in its

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lential Fevers, Hæmorrhages, and Dyſenteries; the Doſe was from four to ten Grains. Externally worn as an Amulet, they eſteemed it a certain Remedy for Epilepſies, and imagined it had the Power of eaſing Terrors, and driving away evil Spirits; tied to the Belly or Thigh of Women with child, they attributed to it the Virtues of the Eagle-ſtone, of ſtaying or forwarding Delivery: and thought it an infallible Preſervative of Chaſtity; to the Violations of which it had that innate Abhorrence, that if but worn on the Finger in a Ring, it flew to pieces on the committing them.

It may not be amiſs to have thus once given an Account of the Virtues the Antients attributed to Gems: for they had almoſt as large a Liſt for every Kind as this. The greateſt part of theſe cannot but be ſeen at firſt view to be altogether imaginary; and as to the Virtues of

ϗ τὸ λυγκύριον. ϗ γὰρ ἐκ τȣ́τȣ γλύφεται τὰ σφραγίδια. ϗ ἔϛι ϛερεωτάτη, καθάπερ λίθος. ἕλκει γὰρ ὥσπερ τὸ ἤλεκτρον· οἱ δέ φασιν ȣ̓ μόνον κάρφη ϗ ξύλον, ἀλλὰ ϗ χαλκὸν ϗ σίδηρον, ἐὰν ᾖ λεπτός. ὥσπερ ϗ Διοκλῆς ἔλεγεν.

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the Gems in general, it is now the reigning Opinion, that they are nearly all ſo, their greateſt Friends allowing them no other than thoſe of the common Cryſtal. However, whether the metalline Particles, to which they owe their Colours, are, in either Quantity or Quality, in Condition to have any Effect in the Body, is a Matter worthy a ſtrict and regular Trial; and that would at once decide the Queſtion between us and the Antients, and ſhew whether we have been too raſh, or they too ſuperſtitious.

[†] There has been more Confuſion and Error about the *Lapis Lyncurius* of the Antients, than about any other Subſtance in the whole foſſile Kingdom. What I have to offer in regard to it, is very different from the generally received Opinions: theſe are, however, firſt to be examined; for if they are right, this has no Title to be heard.

Virtues, as is alſo the *Lapis* [t] *Lyncurius*, which is likewiſe uſed for engraving Seals on, and is of a very ſolid Texture, as Stones are; it has alſo an attractive Power, like that of Amber, and is ſaid to attract not only Straws and ſmall pieces of Sticks, but even Copper and Iron, if they are beaten into thin Pieces. This *Diocles* affirms.

The firſt and moſt generally received is, that it was what we now call the *Belemnites:* This is the Opinion of *Woodward*, &c. &c. &c. how true it may be is to be examined from their Accounts; and as they are, moſt of them, only Copies, and thoſe often erroneous ones, of this Author, he is, where his Deſcriptions are long enough, always firſt to be conſulted, and moſt relied on; and from his Words I venture to pronounce it evident, that the *Lapis Lyncurius* was not the Belemnites. He firſt ſays, it was fit for engraving Seals on; which every one who ever ſaw a Belemnites muſt pronounce impoſſible to have been meant of it; its Structure rendering it the moſt improper Subſtance imaginable for ſuch Uſes. And next, that it was of a very ſolid Texture, like that of the Stones or Gems: the firſt Sight of a *Belemnites* muſt alſo prove, that this was not meant of it; for it is not of a ſolid Texture, nor of

νά. Ἔτι δὲ διαφανή τε σφόδρα ϗ πυῤῥά. Βελτίω δὲ τὰ τῶν ἀγρίων, ἢ τὰ τῶν ἡμέρων. ϗ τὰ τῶν ἀῤῥένων, ἢ τὰ τῶν θηλείων. ὡς ϗ τῆς τροφῆς διαφερȣ́σης, ϗ τȣ̃ πονεῖν, ἢ μὴ πονεῖν. ϗ τῆς τȣ̃ σώματος ὅλως φύσεως, ᾗ τὸ μὲν ξηρότερον, τὸ δὲ ὑγρότερον.

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a Grain, as we call it, any way reſembling that of a Stone, but compoſed of a number of tranſverſe Striæ; and of the Texture, ſpecific Gravity, and Hardneſs of Talk, which could never give it a Title to what our Author ſays of the *Lyncurius*; that it was not only hard and ſolid, but ϛερεωτάτη, extremely ſo. Hence, I preſume, I may firſt venture to pronounce this, which is the common Opinion, evidently erroneous, and that the *Lapis Lyncurius* of the Antients was not the *Belemnites*.

The few who diſſent from this Opinion, of the Number of whom are *Geoffray*, *Geſner* *,

* Ego Lyncurium a ſuccino differre non video: et id quoque pro Gemma habitum olim, præſertim quòd aureo colore pellucet et ſplendet, minimè dubito.

LI. The *Lapis Lyncurius* is pellucid, and of a fire Colour: And thoſe Stones which are produced from the Animal in its native Wildneſs, are better than thoſe from the tame; as alſo thoſe from the Male, than thoſe from the Female: As the different nouriſhment the Creature eats, and the different Exerciſe it uſes, as well as the Difference of its whole Habit of Body, in being either dryer or moiſter, make great Differences in the Stones.

&c. hold, that the *Lapis Lyncurius* of the Antients was no other than Amber. This is the ſecond and only other Opinion worth naming; and the Favourers of it bring many Paſſages from the Copiers of the Antients, to confirm it: All which ſerve to prove what I have before obſerved, that many quote the Antients who have never read them; and ſhew how uſeful, and, indeed, abſolutely neceſſary, a correct Edition of this Work of our Author is, in Reſearches of this kind. This Opinion is even more eaſily than the other proved erroneous from the Words of *Theophraſtus*; who not only compares the *Lyncurius*, in ſome of its Properties, to Amber, which, as I have before obſerved in a parallel Caſe in the Note on the νβ΄. Εὑρίσκουσι δ᾽ ἀνορύττοντες οἱ ἔμπειροι. Κατακρύπτεται γὰρ καὶ ἐπαμᾶται

Sapphire, is ſufficient Proof, that they cannot be the ſame: as no body would ever think of comparing a Thing to itſelf: But after having gone through a compleat Deſcription of the *Lyncurius*, according to the received, though erroneous, Opinion of thoſe Times, of its being produced from the Urine of the Lynx; he begins a ſeparate Account of Amber under its own proper Name; and ſhews he was well acquainted with its Nature and Properties, and knew it to be a native Foſſile. Hence it is therefore alſo evident, that the *Lapis Lyncurius* was not Amber, and that the generally received Opinions of it are both evidently erroneous. That ſuch as had not read the Antients themſelves ſhould fall into Errors of this kind, from the Obſcurity and Confuſion of thoſe who copied from them, we cannot wonder. But here it may not be amiſs to obſerve, that it is not the Antients themſelves, but theſe Copiers and Quoters of them, who are generally obſcure. *Epiphanius*, who was better acquainted with them, has made a different Gueſs, and is, indeed, the firſt Author who has had the leaſt Thought of what I ſhall attempt to prove to be evidently the Truth in regard to this Stone.

LII. They are found, in digging, by People who are ſkilful; though the Creature, when it has voided its Urine, hides it, and heaps the Earth together

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What it is not, has been ſufficiently proved. It remains to enquire, what it really is. The Way to judge of this is, to conſider what the Antients have left us about it: What *Theophraſtus* ſays we have before us. That it was of a ſtony Texture is plain from his Account, and may be confirmed from all thoſe who wrote more determinately; they have always called it, λίθος λαγγούριος. *Epiphanius* has, εὕρομεν δὲ λαγγούριον οὕτω καλούμενον λίθον. And *Pliny*, *l.* 8. *c.* 38. *Lyncum humor ita redditus, ubi gignuntur, glaciatur areſcitque in Gemmas Carbunculis ſimiles, & igneo colore fulgentes Lyncurium vocatas.* Can any one imagine this a Deſcription of a Belemnites? All that we find in the Antients about it, in ſhort, is of this Kind, and determines the *Lapis Lyncurius* to have been a tranſparent Gem, of no determinate Shape, and of a yellowiſh red or flame Colour, ſometimes paler, and ſometimes deeper; which diſtinguiſhed it into Male and Female; as we ſhall ſee hereafter in this Author; and of a Texture fit for engraving on. Had the Antients meant to have deſcribed our Belemnites, they would not only not have named any one of theſe Characters, but would certainly have deſcribed its Shape, which is the moſt ſtriking, obvious, and remarkable thing about it. We are therefore to ſeek for ſome Stone better anſwering this Deſcription; and this we find, even to the utmoſt Exactneſs, in the Gem which we now call the Hyacinth, which it is alſo evident they have never deſcribed under any other Name but this, (for what they called the Hyacinth, was a Stone of a very different Sort, and reckoned by us either among the Garnets or Amethyſts) and which it is not eaſy to conceive how they could better or more exactly have deſcribed, than they have in their Accounts of the *Lyncurius*. I have before obſerved, that *Theophraſtus* mentions more than one Species of it, and we at preſent know three. *Pliny* ſeems, in the Paſſage I have quoted from him, to have meant that beautiful Species of it which we call the *Hyacintha la bella*, a Gem in great Eſteem, of a flame Colour with an Admixture of a deep Red, but without any Tendency to Blackneſs. Theſe we have from *Cambaia*, and other Parts of the *Eaſt Indies*, and ſometimes from *Bohemia*, but not ſo hard or beautiful as the Oriental. Our ſecond Kind are the ſaffron-coloured; theſe are next in Eſteem after the *La Bella*, and are

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γῆν ὅταν ȣ̓ρήσῃ. γίνεται δὲ ϗ̀ κατεργασία τις αὐτȣ͂ πλείων.

about it. The poliſhing theſe Stones is alſo a Work of great Trouble.

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from the ſame Places. The third are the amber-coloured; theſe have no mixture of red; theſe were the female *Lyncuria* of the Antients, and are the leaſt eſteemed of all: They are found in *Sileſia*, *Bohemia*, *Spain*, and *Italy*.

The candid and excellent Dr. *Watſon* has given many Reaſons for ſuppoſing the Antients to have been acquainted with our Tourmaline, and to have known that Stone by the Name of *Lapis Lyncurius*. Theſe are Fields of Conjecture, open to all who rouſe the learned Quarry; and it is with a great deal of Pleaſure I have read thoſe Obſervations of my learned Friend: perhaps a great deal may be ſaid to ſhew they do not diſagree with my own. For thus much is certain, that the Hyacinth, which I underſtand here to be alluded to, has an electric Power.

As to the Stone Æpinus, and others, uſed in their Experiments, and called the Tourmaline; and which their Authority has fixed as the Tourmaline to this Day; that is a peculiar Species of Garnet, differing in every eſſential Character from the other Garnets. It is a priſm of nine Sides, with two trihaedral Pyramids. Its Colour is purple, not fiery red, as the πυῤῥά of *Theophraſtus* muſt compel us to believe the *Lyncurius* to be; nor have we yet νγ΄. Ἐπεὶ δὲ ϗ τὸ [v] ἤλεκτρον λίθος. ϗ γὰρ ὀρυκτὸν τὸ περὶ Λιγυστικήν. ϗ τȣ́-

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ſeen of it with thoſe particular degrees of fainter and fuller Colour, which would beſt anſwer the antique *Lyncurius*. I therefore fear the *Lapis Electricus* of the *Berlin* Memoir, &c. is not the *Lyncurius*: but I am very confident that the Hyacinth has all the ſame Qualities.

[v] This is much to the Honour of *Theophraſtus*. I have before had Occaſion to obſerve, that in departing from the Opinions of this Author, After-ages became more and more ignorant, their Syſtems erroneous, and their Accounts full of Confuſion and Obſcurity; till in ſome late Ages we have been at the pains of unlearning what our Forefathers had been taught by them, and now have brought ourſelves to Syſtems of real Knowledge, by cloſer Obſervations of Nature. In many Caſes, we find all that we have been ſtudying for is to know juſt what we might have learnt from the Works of this Author alone. Of this I have before given ſome Inſtances; and the Sentence before us, is another very remarkable one: That Amber is a Stone, or native Foſſile, the beſt of the modern Writers ſeem as certain, as that Gems, Rocks, or Minerals are ſo. It has, however, for many Ages, been judged by ſome, to be of a vegetable, and by

LIII. [y] Amber alſo is a Stone: It is dug out of the Earth in *Liguria*, and has, as the before mentioned, a Power

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others an animal, nature. And a thouſand idle and incoherent Syſtems have been received as to its Formation: *Dioſcorides* thought it an Exſudation of the black Poplar; and *Pliny*, of the Pine; and others, the Fat or Semen of Whales. And it is but of late, that the World has been again brought into the Opinion, that it is, as this Author eſteemed it, a mere native Foſſile. It is of various Colours, white, brown, and yellow, and is found in Maſſes of different Shapes and Sizes, on the Shores, in many Parts of the World, particularly in *Pruſſia*; but where-ever it is found on the Shores, it is alſo to be found, if carefully ſought for, in the neighbouring Cliffs, the Sea having had no Share in bringing it to light; but that it has, in Storms and high Tides, waſh'd it out of the Strata of thoſe Cliffs, and cleaned and rounded it at the Edges, by conſtantly toſſing it about; and rubbing it againſt harder Subſtances. Amber is naturally inveſted with a Cruſt, as the Flints and other natural foſſile Nodules are; it is found in this State, in digging, in *Pruſſia, Pomerania*, and other Places, and is called Rock Amber. When it has been waſhed out of its native Place by the Sea, and diveſted of this Cruſt, it is called Waſh'd Am-των ἂν ἡ τȣ̃ ἕλκειν δύναμις ἀκολȣθείη. μάλιϛα δ' ὅτι δῆλος ϗ φανερωτάτη τὸν σίδηρον[w] ἄγȣσα. γίνεται δὲ ϗ αὕτη σπα-

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ber, or Smooth Amber. We have of both theſe Kinds in *England*; the rough is found in digging to conſiderable Depths in Clay, but is commonly of an ill Colour, and impregnated with the vitriolic Salts, with which almoſt all our Clay-pits abound; and this in ſuch a degree, as often to crumble and fall to pieces, when it has been ſome time expoſed to the Air: The other, or Waſh'd Amber, we have on many of our Shores, particularly the Northern; and that ſometimes not inferior to the fineſt of the *Pruſſian*. Beſide the Variety of natural Colours in Amber, of which, beſide the common pale yellow, we ſee white, orange, brown, and grey; there are certain Cabinets which now boaſt, red, purple, and green Amber; but I think I am warranted to ſay, that theſe, as well as the fine pale ſtriated Amber, are made ſuch by art: there are ſome Poliſh *Jews* who have this ſecret, and who keep it carefully to themſelves.

[w] The Author takes occaſion here, among the Stones endued with an attractive Quality, to mention the Loadſtone, the moſt known and moſt powerful of them all. The antient *Greeks* called this, Ἡράκλεια λίθος, and the later, Μαγνῆτις λίθος. It has ſince been by ſome im-

of Attraction: But the greateſt and moſt evident attractive Quality is in that Stone which attracts [w] Iron. But

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properly called, inſtead of *Heraclea*, *Herculea*, as if it had obtained its Name from *Hercules*; whereas it had it from *Heraclea*, a City of *Lydia*, near which it was found in great abundance. Κέκληται δὲ οὗτος ἀπὸ τῆς Ἡρακλείας τῆς ἐν Λυδία πόλεως, ſays *Heſychius*. This, therefore, was its original Name among the antient *Greeks*, and indeed its only Name; for the Word *Magnetis*, which was alſo in common Uſe among them, ſignified a quite different Subſtance: Their Μαγνῆτις λίθος was a white ſilvery-looking Stone, with no Power of Attraction, and in frequent Uſe for turning into Veſſels of many kinds, as this Author obſerves in another Place. It was a talcy Stone, of the Ollaris kind; *(ſee Foſſils Arrang'd, p. 27,)* but not exactly the ſame with any we know at preſent. The later *Greeks* calling the Loadſtone by the ſame Name, which both had from *Magneſia* in *Lydia*, the Place where they were found, has occaſioned almoſt endleſs Errors in the leſs cautious Writers ſince. The Loadſtone is a ferrugineous Subſtance, found in many Parts of the World, and in Maſſes of different Size: It is commonly met with in or about Iron Mines, and among ferrugineous Matter. We have them from moſt Parts of

νία, καὶ ὀλιγαχοῦ. καὶ αὕτη μὲν δὴ συναριθμέισθω τὴν δύναμιν ὁμοίαν ἔχειν.

νθʹ. Ἐξ ὧν δὲ τὰ σφραγίδια ποιεῖται, καὶ ἄλλα πλέιους εἰσίν. οἷον ἥθ' [x] Ὑαλοειδὴς, ἡ καὶ ἔμφασιν ποιεῖ καὶ διάφασιν. καὶ τὸ Ἀνθράκιον, καὶ ἡ [y] ὄμφαξ. ἔτι δὲ καὶ ἡ [z] Κρύσταλλος, καὶ τὸ

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the World, and there are very good ones found in *England:* Many have been picked up in *Devonſhire* and the neighbouring Counties, as well as other Parts of the Kingdom; and I not long ſince found a Fragment of one, which will take up a ſmall Needle, within two Miles of *London*.

[x] The Hyaloides has been by different Authors ſuppoſed to be the *Aſteria*, the *Iris*, the *Lapis Specularis*, and the Diamond; all which ſeem very random Gueſſes, and liable to Objections not to be ſurmounted. The Stone, I think, appears rather to be the *Aſtrios* of *Pliny*, which he deſcribes to be a fine white or colourleſs Gem, approaching to the Nature of Cryſtal, and brought from the *Indies:* His Words are, having been ſpeaking of the *Aſteria*, *Similiter candida eſt, quæ vocatur Aſtrios,*

that is a ſcarce ſtone, and found in but few Places: It ought, however, to be ranked with theſe Stones, as it poſſeſſes a like Quality.

LIV. There are, beſide theſe, many other Gems uſed for the engraving Seals: As the [x] Hyaloides, which reflects the Images of Things, and is pellucid; the Carbuncle, and the [y] Omphax; as alſo [z] Cryſtal, and the

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cryſtallo propinquans, in India naſcens, & in Pallenes Littoribus. Intus a centro ceu ſtella lucet, fulgore Lunæ Plenæ. Quidam cauſam nominis reddunt quòd Aſtris oppoſita fulgorem rapiat, & regerat; optimam in Carimania gigni nullamque minus obnoxiam vitio, l. 37. *c.* 9. And Stones of this Kind have of later Years been found near the River of the *Amazons* in *America*, and taken for Diamonds.

[y] The Omphax was moſt probably the *Beryllus Oleaginus* of *Pliny*; which, from what is left us about it, appears to have but little deſerved to be ranked among the Beryls, and ſeems much more properly diſtinguiſhed by a particular Name, as this Author has allowed it.

[z] Cryſtal is the moſt known and moſt common of all this Claſs of Stones. Our Lapi-

[a] 'Αμέθυσον. ἄμφω δὲ διαφανῆ.

νέ. Εὑρίσκονται δὲ ϗ αὗται, ϗ τὸ Σάρδιον, διακοπτομένων τινῶν ϖετρῶν.

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daries diſtinguiſh it into two Kinds, the Spring Cryſtal; and Pebble Cryſtal. The firſt is found in the perpendicular Fiſſures of Strata, commonly in Form of an hexangular Column, adhering to the Matter of the Stratum at its Baſe, and terminating at its other End in a Point. The other is found lodged at random in the ſtony or earthy Strata, or looſe among Gravel, and is of no certain or determinate Shape or Size, but reſembles the common Flints or Pebbles in Form.

There are, beſide theſe, regular and hexangular Cryſtals, found alſo lodged in the Strata, ſometimes pointed at both Ends, ſometimes covering the external Surface of ſmall roundiſh Nodules, and ſometimes ſhot all over the Inſide of hollow ones of various Sizes: Theſe laſt are called the echinated and concave cryſtalline Balls; and the former the double-pointed Cryſtal, *Cryſtallus in acumen utrinque deſinens*. The Pebble Cryſtals of *England* are often of very conſiderable Hardneſs; and ſome have been found here which the Lapidaries have ſaid approached to the white Sapphire. The pointed

[a] Amethyſt; both which are, in like manner, pellucid.

LV. Theſe, as alſo the Carnelian, are ſometimes found in the dividing other Stones.

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and hexangular are what Authors have called *Iris's* and *Pſeudo-adamantes*. The Antients were of opinion, that Cryſtal was only Water congealed in long tract of Time, into an Ice, more durable than the common. And *Pliny* thought it was no where to be found but in exceſſively cold Regions; but we are now very certain, that it is even in the hotteſt. As to the various Forms of Cryſtal, they will be no where ſo well known, as from the Cryſtallographie of the great and incomparable *De L'iſle*.

[a] The Amethyſt of the Antients was the ſame with the Gem known yet by that Name: It is a very elegant Stone, of a purple or violet Colour, in different Degrees of Deepneſs. It is found both in the Fiſſures, and lodged among the Matter of the Strata; and ſometimes, like common Cryſtal, in concave Balls, reſembling the Ætitæ. It owes its Colour to Iron: And common Cryſtal and Spar are often found in and about Mines of that Metal, tinged in different Degrees to a Reſemblance of it. The Antients reckoned five Species of the Amethyſt, differing in Degrees of Colour; and we have at leaſt as

νϛʹ. Καὶ ἄλλαι δ', ὡς ϖροείρηται, ϖρότερον διαφορὰς ἔχȣσαι, ϗ συνώνυμοι ϖρὸς ἀλλήλας. Τȣ͂ γὰρ Σαρδίȣ, τὸ μὲν διαφανὲς, ἐρυθρότερον δὲ, καλεῖται [b] θῆλυ· τὸ δὲ διαφανὲς μὲν, μελάντερον δὲ, ϗ ἄρσεν. ϗ τὰ λυγκȣ́ρια δ' ὡσαύτως.

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many among the Jewellers at preſent, though they are not at the pains to diſtinguiſh them by particular Names; they divide them in general into Oriental and Occidental: The former are very ſcarce, but of great Hardneſs, Luſtre, and Beauty; the latter are had from many Places, particularly *Saxony*, *Germany*, and *Bohemia:* They are often as finely coloured as the Oriental, but are ſoft. In *England* we alſo ſometimes find them very beautiful, and of tolerable Hardneſs.

The Amethyſt loſes its Colour in the Fire, like the Sapphire and Emerald: The Oriental Kind, diveſted of its Colour by this Means, comes out with the true Luſtre and Water of the Diamond; and is ſo nice a Counterfeit of it, that even a very expert Jeweller may be deceived by it.

[b] The Diviſion of the Gems into Male and Female, from their deeper or paler Colour, I

LVI. Other Differences there alſo are, as was before obſerved, in Gems of the ſame Name: As in Carnelians, that Species which is pellucid and of a brighter red, is called the [b] Female; and that which is pellucid and of a deeper red, with ſome Tendency to Blackneſs, the Male. The *Lapis Lyncurius* is diſtin-

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have before obſerved, is in a Manner general, and runs through almoſt the whole Claſs: The Male is always the deeper, the Female the paler; tho' both Kinds, as they are called, are often found in the ſame Stone. This Difference in the Degree of Colour, happens from the different Quantity of the metalline Particles, to which they all owe their Colours, as mixed with them at their original Formation: And I make no doubt, but that there are ſome of all the Kinds perfectly colourleſs, if we were enough acquainted with their exact Texture and Degree of Hardneſs to be able to diſtinguiſh them by it. If we were, we ſhould as ſurely find white Emeralds, and white Amethyſts, as white Sapphires; there being ſcarce any of the coloured Gems of which we do not ſee the Male and Female, as they are called; and of which ſome Specimens of the Female are not found nearly as colourleſs as Cryſtal.

ὧν τὸ θῆλυ διαφανέστερον, ϗ ξανθότερον. καλεῖται δὲ ϗ [c] κυανὸς, ὁ μὲν ἄῤῥην, ὁ δὲ θῆλυς. μελάντερος δὲ ὁ ἄῤῥην.

νζ. Τὸ δ' [d] ὀνύχιον, μικτὴ λευκῷ ϗ

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[c] The Carnelian and *Lapis Lyncurius* have been ſpoken of already. The Gem which the Antients called *Cyanus*, is what we now know by the Name of *Lapis Lazuli*; a Stone common among us in the Tops of Snuff-boxes and other Toys; and of which the glorious blue Colour, called Ultramarine by the Painters, is made. This has alſo been already treated of occaſionally in the Notes on the Sapphire. To what is there ſaid, it may be not improper to add, that it is a true Copper Ore, generally yielding about $\frac{1}{5}$ of that Metal, and commonly a little Silver: It is of two Kinds, the Oriental, and *German*; the former is from *Aſia*, *Africa*, and the *Eaſt Indies*; the Colour produced from this is not ſubject to Injuries, from Time or any other Accidents: The *German* is found not only in the Kingdom whoſe Name it bears, but in *Spain*, *Italy*, and *Saxony* alſo; in Mines of different Metals, particularly of Copper. The Colour made from this is ſubject to Injuries from many Accidents, and in

guiſhed in like manner, the Female of which is more tranſparent, and of a paler yellow; and the [c] *Lapis Cyanus* is in the ſame manner divided into Male and Female; the Male is in this alſo of the deeper Colour.

LVII. There is alſo the [d] Onyx, variegated with white and brown placed

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Time uſually turns green. The Stone, whereever found, is generally of the ſame Figure and Complexion, excepting, that the Oriental is harder than the other Kinds. It is compoſed always of three Subſtances, with which there is ſometimes mixed a fourth, a Kind of Marchaſite, of a ſhining yellow Colour, and flying off in the Calcination with a ſulphureous Smell, like that of the common Pyritæ; the other three Subſtances, of which it is conſtantly compoſed, are hard, fine cryſtalline Matter, ſaturated with Particles of Copper, and by them ſtained to a beautiful deep blue: This is what may be called the Baſis, and is variegated with a white cryſtalline Matter, and a yellow Talc of the foliaceous Kind; but the Flakes of it are ſo ſmall, that the Whole appears in the Form of a Powder.

[d] The Oynx is a ſemi-pellucid Stone, of a fine flinty Texture, taking an excellent Poliſh, and is ſtrictly of the Flint Claſs.

φαιῷ παρ' ἄλληλα. τὸ δ' ἀμέθυσον οἰνωπὸν τῇ χρόᾳ.

νή. Καλὸς δὲ λίθος ϗ ὁ [a] Ἀχάτης, ὁ

I have before obſerved, in the Note on the Alabaſter, that that Stone had, from its ſimilar Uſe among the Antients, alſo the Name of this Gem; and that great Errors had been occaſioned, by later Authors not underſtanding always which of the two they meant. But this is not all the Confuſion there has been in regard to this Stone; for the Antients have, many of them, deſcribed it ſo looſely and indeterminately, that it is ſcarce poſſible, from their Writings, to fix any Characteriſtic, or ſay determinately what their Onyx was: And we find, in conſequence of this, many different Stones deſcribed as Onyxes by the Writers ſince. It is to the Honour of *Theophraſtus*, however, to be obſerved, that he has ſtrictly and exactly determined what this Stone was; and that if the late Writers had conſulted him, inſtead of being led into a thouſand Mazes by the leſs ſcientific Authors ſince, they would never have deſcribed Carnelians, and a multitude of other different Stones, under this Name; but have known, that the Onyx was as much a diſtinct Stone with him, as the Emerald or the Amethyſt, and as different from many of thoſe they have deſcribed under its Name, as they from one another.

alternately; and the Amethyſt, which reſembles Red-wine in Colour.

LVIII. The [a] Agate alſo is an elegant

From his Account we are to determine, then, that the Onyx is a Stone of a whitiſh Ground, variegated with Zones of brown: And ſuch are the true and genuine Onyxes we ſee at preſent. What may farther be added to its Deſcription is, that its Ground is often of the Colour of the human Nail, bright and ſhining; the Zones are laid in perfect Regularity, and do not, according to the Judgment of the niceſt Diſtinguiſhers of the preſent Times, exclude it from the Onyx Claſs, of whatſoever Colour they are, except red, in which caſe it takes the Name of Sardonyx: The Colour of the Ground, and Regularity of the Zones, are therefore the diſtinguiſhing Characteriſtics of this Stone: And in the laſt, particularly, it differs from the Agate, which often has the ſame Colours, but placed in irregular Clouds, Veins, or Spots.

We have our Onyxes both from the *Eaſt* and *Weſt Indies*; as alſo from *Spain*, *Italy*, and *Germany*; and there have been tolerably fine ones found in *England*.

[a] The Agate is another of the ſemi-pellucid Stones of the Flint Claſs; it is nearly of the ſame Degree of Hardneſs with the Onyx; and differs from it, as was before obſerved, in the

ἀπὸ τȣ͂ Ἀχάτȣ ϖοταμȣ͂ τȣ͂ ἐν Σικελίᾳ. ϗ ϖωλεῖται τίμιος.

irregular and uncertain Manner of its Spots, Clouds, and Variegations, being placed. It has commonly a grey horny Ground; its Variegations are of different Colours, and often moſt beautifully diſpoſed; repreſenting ſometimes, very exactly and elegantly, Trees, Shrubs, and Plants, Clouds, Rivers, and Foreſts, and ſometimes Animals: There are Stories of very ſtrange Repreſentations on ſome of them; and, indeed, the beautiful Images we often now ſee upon ſome, may incline one to believe many of the ſtrange Things we hear of them.

The Antients have diſtinguiſhed Agates into many Species, to each of which they have given a Name, importing its Difference from the common Agate; whether it were in Colour, Figure, or Texture: From their Colours, they called the red *Hæmachates*, the white *Leucachates*, and the plain yellowiſh, or wax-coloured, *Cerachates*. Thoſe which approached to, or partook of the Nature of other Stones, they diſtinguiſhed by Names compounded of their own generical Name, and that of the Stone they reſembled or partook of: Thus that Species which ſeemed allied to the Jaſpers they called *Jaſp-Achates*; and that which partook of the Nature of the Carnelian, *Sard-*

Stone; it has its Name from the River *Achate* in *Sicily*; and is ſold at a great Price.

Achates; and thoſe which had the Reſemblance of Trees and Shrubs on them, they called, for that Reaſon, *Dendrachates:* Theſe are what our Jewellers at this Time call *Mocho*-Stones, but improperly; for they are not the Product of that Kingdom, but are only uſed to be brought from other Countries, and ſhipped there for the Uſe of our Merchants.

Others they have named idly from their imaginary Virtues; as that Kind which they ſuppoſed had the Power of conquering the Rage of Lions, and other wild Beaſts, they called therefore Λεοντοσέρες, which ſome have imperfectly tranſlated *Leonina* only, and ſuppoſe the Stone to have been ſo named, from its being of the Colour of a Lion's Skin: How much they were miſtaken, we may know from this remarkable Deſcription of it in ſo old an Author as *Orpheus:*

> ᾿Αλλ' ȣ̃τος πάντων προφερέϛατος, εἴκε μιν εὕροις
> Εἶδος ἔχοντα δαφοινὸν ἀμαιμακέτοιο δράκοντος,
> Τῷ καί μιν προτέροισι λεοντοσέρην ὀνομῆναι
> Ἥνδανεν ἡμιθέοισι, κατάϛικτον σπιλάδεσσι
> Πυρσαῖσι λευκαῖς τε, μελαινομέναις χλοεραῖς τε.

Pliny ſeems not to have perfectly underſtood νθʹ. Ἐν [b] Λαμπψάκῳ δὲ ϖοτ' ἐν τοῖς χρυσίοις εὑρέθη θαυμαστὴ λίθος, ἐξ ἧς ἀνενεχθείσης ϖρὸς Τίραν, σφραγίδιον γλυφερὸν ἀνεπέμφθη Βασιλεῖ, διὰ τὸ ϖεριττόν.

ξʹ. Καὶ αὗται μὲν ἅμα τῷ καλῷ ϗ τὸ σπάνιον ἔχουσιν. αἱ δὲ δὴ ἐκ τῆς Ἑλλάδος, εὐτελέστεραι.

ξάʹ. Οἷον τὸ ἀνθράκιον τὸ ἐξ Ὀρχομενοῦ

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the Hiſtory of this Species; as he is too often alſo in other Places guilty of Errors, in regard to the *Greek* Authors from whom he takes his Accounts of Things. Indeed it ſeems much to be queſtioned, whether the Stone itſelf be not as much the Product of Imagination, as the Virtues aſcribed to it: However, as there was ſo evident a Proof as this, of its having obtained its Name from its ſuppoſed Virtues, becauſe it was πάντων προφερέστατος; not its Colour; I could not omit giving it a Place, to aſcertain the original Meaning of a Name ſo much miſunderſtood.

The Agate was firſt diſcovered in the River *Achate*, from which, as our Author obſerves, it had its Name, but has ſince been found to

LIX. There was alſo once found in the Gold Mines of [b] *Lampſacus*, an admirably beautiful Gem, on which, after it had been ſent to *Tyre*, a Seal was engraved, which for its Excellence was preſented to the King.

LX. Theſe are very beautiful, and very ſcarce: But thoſe produced in *Greece*, are of the meaneſt and worſt Kind.

LXI. Such are alſo the Carbuncles

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be the Product of almoſt every Nation upon Earth. The fineſt in the World are thoſe of the *Eaſt Indies:* It is found alſo in great Plenty in *Italy*, *Spain*, and *Germany*, where there are ſometimes alſo very elegant ones; *England* is not without them: In general, the *Engliſh* are not good; but ſome few of them have been found little inferior to the fineſt.

[b] *Lampſacus* was a City of *Aſia*, near the *Helleſpont*, in the Neighbourhood of which there were Mines worked for Gold, Silver, and Copper. What the Gem was, here mentioned by the Author, there is no determining; but in all Probability, from its having a Place ſo near the Agates, it was a more than ordinarily beautiful Stone of that Kind.

τῆς Ἀρκαδίας [c]. ἔστι δ' οὗτος μελάντερος τοῦ Χίου. κάτοπτρα δὲ ἐξ αὐτοῦ ϖοιοῦσι. ϗ ὁ Τροιζήνιος [d], οὗτος δὲ ϖοικίλος, τὰ μὲν φοινικοῖς, τὰ δὲ λευκοῖς χρώμασι. ϖοικίλος δὲ ϗ ὁ Κορίνθιος, τοῖς αὐτοῖς χρώμασι. ϖλὴν τὸ λευκότερον ϗ χλοροειδέστερον. τὸ δ' ὅλον ϖολλοὶ τυγχάνουσιν οἱ τοιοῦτοι.

ξϛ'. Ἀλλ' οἱ ϖεριττοὶ σπάνιοι, ϗ ἐξ ὀλίγων τόπων [e]. οἷον ἔκ τε Καρχηδόνος,

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[c] The *Arcadian* Carbuncles of the Antients, were of the Garnet kind, but ſo deep coloured, that they were little eſteemed; and thoſe of other Countries, which were of the ſame kind, but little regarded among them. It appears to me, that our Tourmaline was known to them by the Name of an *Arcadian* Carbuncle.

[d] The *Træzenian* I have before obſerved, in the Notes on the Anthrax, was what we call the Amandine, a Stone now little known or regarded. And the *Corinthian* ſeems to have been only a meaner and worſe Kind of it: Toward the end of the Deſcription of this Species, after the Word πλὴν, there was a Lacuna, affording room for a Word of about three or

of *Orchomenus* in [c] *Arcadia*, which are darker coloured than the *Chian*; but are, however, uſed for making Mirrors; and the *Trœzenian* [d], which are variegated with purple and white: The *Corinthian* is alſo of this Kind; it is variegated with the ſame Colours, but is whiter and paler. And finally, there are many others of this Sort.

LXII. But the moſt perfect and valuable Carbuncles are ſcarce, and had only from a few Places [e], as *Carthage*

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four Syllables; it is here filled up from *Salmaſius*, whoſe Motive for giving the Word λευκότερον was, that *Pliny*, who has copied this Paſſage from *Theophraſtus*, ſhews, that he had read or underſtood it ſo; by giving *pallidiores & candidiores* for it. And it may be obſerved in general, that there is no better way of judging of the obſcurer Paſſages of the Antients at this time, than by obſerving how they have underſtood one another.

[e] The Antients we find made great Diſtinction between the different Species of the Carbuncle; on ſome of which they ſet almoſt no Value; and others they eſteemed at a very high Rate. This Author has very carefully and ex-

ϗ̀ τῶν περὶ Μασσαλίαν, ϗ̀ ἐξ Αἰγύπτȣ, ϗ̀ ἐκ τῶν καταδȣ́πων, ϗ̀ Συήνης πρὸς Ἐλεφαντίνῃ πόλει. ϗ̀ ἐκ τῆς Ψηβὼ καλȣμένης χώρας.

ξγ́. Καὶ ἐν Κύπρῳ ἥ τε Σμάραγδος, ἡ ϗ̀ Ἴασπις [f], οἷς δὲ εἰς τὰ λιθόκολλα

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actly diſtinguiſhed and aſcertained the Places of the one as well as the other.

The *Carthaginian* or *Garamantine* Carbuncle was, as I have obſerved in another Place, what we now call the Garnet, *&c.* This Place was ſo famous for it, that it was called by many the *Carchedonius Lapis*, Καρχηδόνιος λίθος.

> *Quo Carchedonios optas ignes lapideos*
> *Niſi ut ſcintillent?* Publ. Syr.

That the *Carthaginian* and *Garamantine* Carbuncle were really the ſame Stone, is aſcertained by *Strabo*, ἡ δὲ ὑπὲρ τῶν Γαιτȣ́λων ἐϛὶν ἡ τῶν Γαραμάντων γῆ παράλληλος ἐκείνῃ, ὅθεν οἱ Καρχηδόνιοι κομίζονται λίθοι. And *Epiphanius* adds his Confirmation of this Place being famous for the Carbuncle, γίνεται δὲ ἐν Καρχηδόνι τῆς Λιβύης. *Pliny*, and other of the Antients, confirm alſo their being found in *Egypt* and *Maſſilia*; and *Salmaſius* has very judiciouſly rendered the laſt and *Maſſilia*, from *Ægypt*, about the Cataracts of the *Nile*, and the Neighbourhood of *Syene*, a City of the *Elephantines*, and from the Country called *Pſebos*.

LXIII. In *Cyprus* alſo are found the Emerald and the Jaſper [f]; but what are

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mentioned Place intelligible, by altering it from Ψηφὼ, as it always before was written, to Ψηϐὼ, the Name of a Kingdom in the inland part of *Æthiopia*. It is to be obſerved, however, that the following Ages grew nicer in regard to their Gems; for two of the Kinds we find here placed among the more perfect and valuable, the *Egyptian*, and (according to the juſt mentioned Emendation of Ψηϐὸς) *Æthiopian*, were even before the Days of *Pliny*, ranked among the meaner Kinds; *Archelaus & in Ægypto circa Thebas naſci tradidit fragiles, venoſas, morienti Carboni ſimiles.* And, *Satyrus Æthiopicos dicit eſſe pingues lucemque non emittentes, aut fundentes, ſed convoluto igne flagrantes.* Lib. 37. c. 7.

[f] The Jaſper and the Emerald in general have already been ſpoken of. The *Bactrian* Emeralds were allowed, as has been obſerved, the ſecond place in Value: Our Author's Account of them, and the Place and Manner in

χρῶνται, ἐκ τῆς Βακτριανῆς εἰσὶ ϖρὸς τῇ ἐρήμῳ. συλλέγουσι δ' αὐτοὺς ὑϖὸ (τοὺς) Ἐτησίας, ἱππεῖς ἐξιόντες· τότε γὰρ ἐμφανεῖς γίνονται, κινουμένης τῆς ἄμμου, διὰ τὸ μέγεθος τῶν ϖνευμάτων. εἰσὶ δὲ μικροὶ καὶ οὐ μεγάλοι.

ξδ'. Τῶν σπουδαζομένων δὲ λίθων ἐστὶ καὶ ὁ Μαργαρίτης καλούμενος, οὐ διαφανὴς

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which they were found, has been copied by moſt of the Writers after him, though all of them have not been careful enough to do him juſtice, by doing it correctly. It is evident, that *Pliny* rendered his κινουμένης τῆς ἄμμου, *tellure aperta*, (though it is not exactly ſo printed in any of the Copies, but, *tunc enim terta, terſa*, or *tellure internitent,)* becauſe *Solinus* and *Iſidorus* have it, *tunc enim detecto ſolo facillime internitent*, and *tunc etiam tellure deoperta intermicant*; which ſhews that they had read it *tellure aperta* in him; however our later Copies may have deviated from the old ones. But the ſame *Iſidorus* condemns *Pliny* in another part of this Sentence, by tranſcribing from him his noted Error, of rendering the τὰ λιθόκολλα of *Theophraſtus* by *colliguntur enim in commiſſuris ſaxo-*

uſed for ſetting in Cups and other Veſſels of Gold, they have from *Bactriana*, toward the Deſart: They go thither on Horſeback to ſearch for them, at the Time of the blowing of the Eteſian or annual Eaſterly Winds; for they are ſeen at that Time, as the Sands are violently toſſed about by the Winds: What they find there, however, are but ſmall.

LXIV. Of the Number of the Precious Stones is that alſo which is called

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rum: The Meaning of *Theophraſtus* evidently is, that theſe *Bactrian* Emeralds were uſed for ornamenting Veſſels of Gold, by being fixed in them in various Figures. That this was a common piece of Luxury among the Antients, and that Emeralds and Berylls, the only other green Gem, were moſtly employed in it, as making the beſt Figure in Gold, is to be ſeen in many Paſſages of the Antients.

Gemmatum Scythicis ut luceat ignibus aurum
Adſpice quot digitos exuit iſte calyx.
Martial.

——— *& inæquales Beryllo*
Virro tenet Phialas. Juvenal.

What the Author here means by εἰς τὰ λιθόκολλα, μὲν τῇ [g] φύσει. ποιοῦσι δ' ἐξ αὐτοῦ τοὺς πολυτελεῖς ὅρμους· γίνεται δὲ ἐν ὀστρείῳ τινὶ, παραπλησίως ταῖς πίνναις· φέρει δ' ἥ τε Ἰνδικὴ χώρα, ϗ νῆσοι τινὲς τῶν ἐν τῇ Ἐρυθρᾷ.

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is evidently, that theſe *Bactrian* Emeralds, though very fine, were but ſmall; and therefore principally uſed to ſtud and ornament Veſſels of Gold. And this *Pliny* has ſo far miſunderſtood, that he has tranſlated it, that they were found in the *Commiſſuræ Saxorum*. And as Errors never fail to be faithfully copied and handed down to Poſterity, this has been carefully delivered to us by every Author ſince; while *Theophraſtus*, who never meant any ſuch thing, or imagined there were any ſuch things as Stones to be found in thoſe Deſarts, was either forgot, or accuſed of the Error.

[g] The Pearl was in great eſteem among the Antients. It was by the *Romans* allowed the ſecond Place among Jewels: and ſeems ever to have been a particular Favourite with the Ladies.

Pearls are produced in many kinds of Shell-fiſh; but the fineſt, and what are properly the genuine Pearl, are bred in the *concha margaritifera pleriſque, Berberis antiquis Indis dicta*. Liſt. Hiſt. Conch. Our Author ſeems the[s] Pearl. It is not of a pellucid Nature, but Bracelets, and other Ornaments of great Value are made of it. It is produced in a kind of Oyſter, and, in like manner, in the *Pinna marina*; and is found in the *Indies*, and on the Shores of certain Iſlands in the *Red Sea*.

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to have been very well acquainted with the Hiſtory of the Pearl; and, doubtleſs, means this very Shell by his ὀϛρείῳ τινί. *Androſthenes* alſo confirms its being this very Shell that the fine Oriental Pearls are found in, ἐν δὲ ἴδιον καλοῦσιν ἐκεῖνοι Βερβερι, ἐξ ὧ ἡ μαργαρῖτις λίθος. I have ventured to add an ϛ to the Word παραπληϛίῳ in the *Greek* Text, becauſe the Senſe and original Meaning of the Author ſeem to have been ſo. The Shell which produces the Pearl is not at all like the Pinna, and ſome have cenſured this Author for ſaying it was; which he ſeems never really to have done, but to have known the Hiſtory of the Subſtance he is treating of much better; and to have ſaid, as I have made it by the Addition of that ſingle Letter, probably loſt in ſome of the Copies, that the Pearl is produced in the Berberi, and in like manner in the *Pinna marina*; which it alſo was, and which the Antients knew it was.

The Pearl is no more than a morbid Excreſξέ. Τὸ μὲν οὖν περιττὸν σχεδὸν ἐν αὐταῖς. εἰσὶ δὲ ϗ ἄλλαι τινές. οἷον ὅ, τε ἐλέφας ὀρυκτὸς [h], ποικίλος μέλανι (ϗ λευκῷ)· ϗ

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cence from the Animal in which it is found: it conſiſts of ſeveral Laminæ laid cloſely round one another, as the Bezoar, the Calculi in human Bladders, and other animal Stones. When ſmall, ſuch are called Seed-pearls, and when larger than ordinary, *Uniqnes*. Our Jewellers diſtinguiſh them into Oriental and Occidental. They are found in many Places, as well as in different Shells. The fineſt in the World are thoſe of the *Perſian* Gulph: There are a great number found about *Cape Comorin* and the Iſland of *Ceylon*, but they are greatly inferior to the *Perſian*. Very large ones have been found about *Borneo*, *Sumatra*, and the neighbouring Iſlands, but not of the fine Shape and Water of the *Perſian*.

The Occidental have a milky Caſt, and want the poliſhed Gloſs of the Oriental. They are very plentiful in many Parts of *America*; as alſo in *France*, *Italy*, and *Scotland*; and we meet with them every Day in our Oyſters and Muſcles here, but ſeldom of any great Beauty.

Some have been of Opinion, that they were bred ſingly, one only in a Shell; and that they thence had their Name Uniones; but this is an Error, many being very frequently found toge-

LXV. Theſe are of peculiar Excellence and Value. And there are yet alſo ſome others to be mentioned; as the foſſile [h] Ivory, which is variegated with

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ther; nay, there are Accounts of one Shell producing 120.

[h] Foſſile Ivory and Bones of Animals lodged long before in the Earth, are frequently dug up in all Parts of the World. Theſe Subſtances have preſerved their Texture, Solidity, and Colour, in different Degrees, according to the Nature of the Matter among which they have lain: Sometimes they are dug up firm, ſolid, and ſcarce altered; ſometimes ſo rotten, as to crumble to pieces in handling; and ſometimes ſtained to various Colours, from the diſſolved Particles of metalline or mineral Matter among which they have been lodged.

Of this Kind is the Turquoiſe, generally eſteemed and called a Stone, but, in reality, no other than the Bones and Teeth of Animals, accidentally lodged near Copper Mines, or Places where there is cupreous Matter in the Earth. This Metal, if diſſolved by a proper acid Menſtruum, makes the Bone a green Turquoiſe, of which there are ſome found in *Germany* and elſewhere: And if the cupreous Particles have been diſſolved in a proper alcaline Menſtruum, they convert the Bones or Teeth, into the Subſtance of which they penetrate, into the comἣν καλοῦσι [i] Σάπφειρον. αὕτη γὰρ μέλαι-

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mon blue Turquoiſe. This Colour it is ſometimes found beautifully and equally tinged with all through; and ſometimes only in Spots and Lines of a very deep Blue, but which the Aſſiſtance of Heat will diffuſe through the whole Maſs, and make it as beautifully palely, and uniformly blue, as that found naturally ſo.

The Word μέλανι in this Place has been always tranſlated black; and *Pliny* copies it in that Senſe from this Author; for he ſays, *Theophraſtus auctor eſt & ebur foſſile candido & nigro colore inveniri.* If we may be allowed to underſtand it as I have done, only in the very Senſe in which he uſes it in the next Line; and judge that he means by it no more than a deep Blue; as 'tis certain he there does, where he applies it to the Sapphire; for Nobody can imagine he intended to call that black; if we receive the Word, in this Senſe, and determine that the Author means to ſay, that foſſile Ivory was white variegated with blue; and remember what is juſt before obſerved of the Turquoiſes only ſpotted and veined with a very deep Blue, as thoſe of *France* all are; and many of many other Places, till brought to the Fire; we ſhall underſtand this Paſſage, the Meaning of which has never yet been gueſs'd at, in a white and a dark Colour; and the [i] Sapphire, which is of a dark Dye, and not

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very clear and very particular Light: and find, that the Subſtance here deſcribed is the genuine rough Turquoiſe, which our Author has very properly called no other than foſſile Ivory, as perhaps all he had ſeen was of Elephants Teeth; and ſeems very well acquainted with it in its rough State. Whether the manner of diffuſing its Colour by Fire was known at that Time, is more than can now be poſitively determined: Moſt probably it was not, and they looked upon the native blue Turquoiſe, which they called *Callais*, as a different Subſtance.

That the Syſtem of the Turquoiſes owing their Colour to Copper diſſolved in a proper Alcali, is juſt, I have this to prove; that by a ſimilar Operation I have myſelf made Turquoiſes, many of which I have now by me, and which have been acknowledged true ones by our beſt Lapidaries.

[i] The Sapphire has been ſpoken of at large already; I ſhall only add here, that the Word μέλαινα in this Place evidently ſignifies not black, but deep blue, as I have underſtood it in the former Line. And that this Paſſage is a ſtrong Confirmation, that the Sapphire and Cyanus are not the ſame Stone, ſince he here compares one of them to the other. And, as I have often had Occaſion before to obſerve, we

να, ἐκ ἄγαν πόῤῥω τȣ͂ κυανȣ͂ τȣ͂ ἄῤῥενος· ϗ [k] Πρασίτης· αὕτη δὲ ἰώδης τῇ χρόᾳ.

ξϛʹ. Πυκνὴ δὲ ϗ [l] Αἱματίτις. αὕτη δ’

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cannot ſuppoſe he would compare a Thing to itſelf.

[k] The Praſius is the Stone known by our Jewellers under the Name of the Root of the Emerald; and before mentioned in the Notes on that Gem.

It is a Gem of the lower Claſs, of an impure green, in which there is commonly ſome Tinge of yellow. The Antients diſtinguiſhed it into three Kinds; the one of a plain yellowiſh green, the others variegated with white, and with red. We often ſee it now coloured from the other Gems or coloured Stones on which it is produced, but make no Diſtinctions from thoſe Accidents.

We have, however, as the Antients had, three Kinds of it diſtinguiſhed by Colour, though none of them variegated; they are, the deep green, the yellowiſh green, and the whitiſh yellow; the laſt has very little green in it, and more properly belongs to the *Lapis Nephriticus* Claſs, as being but ſemi-pellucid.

It is found in the *Eaſt* and *Weſt Indies*, and in *Germany*, *Sileſia*, *Bohemia*, and *England*; but is little valued any where.

Woodward errs in thinking our Jewellers call very different from the Male Cyanus; as alſo the [k] Praſius, which is of an æruginous Colour.

LXVI. And the [l] Hæmatites, or

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this the Smaragdo-Praſus: that and the Chryſopraſus are both, indeed, called Species of it, but are much ſuperior to it in Beauty and Value. The Chryſopraſus is a Stone of greater Luſtre and Hardneſs than the Praſius, and is in Colour of an equal Mixture of green and yellow. And the Smaragdo-Praſus, a beautiful Gem, of a graſs green, with the ſlighteſt Caſt imaginable of yellow.

The Diſtinctions between the Emerald, Praſus, Chryſopraſus, and Smaragdo-Praſus, are, indeed, very nice, but they are very juſt. The Antients, we find, were well acquainted with them; and ſome of our Lapidaries are very clear in them at this Time. As the Hiſtory of Gems is at beſt a thing too full of Confuſion and Uncertainty, we ought, of all things, to avoid adding to it, by loſing more of the old Diſtinctions.

[l] The Hæmatites is an Iron Ore, and a very rich one, perhaps the richeſt of all; for there is ſome of it which contains more than half Iron. It is generally of a ferrugineous reddiſh Colour, very heavy, and in Texture reſembling the fibrous Talcs. The Antients had five Kinds of it, ſome of which are now loſt: The

αὐχμώδης, ἢ, κατὰ τοὔνομα, ὡς αἵματος ξηροῦ πεπηγότος. ἄλλη δὲ καλουμένη Ξανθὴ, οὐ μὲν τὴν χρόαν, ἔκλευκος δ', ὃ μᾶλλον καλοῦσι χρῶμα οἱ Δωρεῖς ξανθόν.

ξζ΄. Τὸ γὰρ || Κουράλλιον, (ϗ γὰρ

Ethiopian, which was the moſt eſteemed, and probably meant by the firſt Kind mentioned here, was of the ſame Nature with ours. The *Xanthus* or *Xuthus*, ξουθὸς, here mentioned afterwards, was that which was afterwards called *Elatites:* It was naturally of a pale, yellowiſh Colour, but became red, as all ferrugineous Bodies do by burning.

Our Hæmatites is ſometimes of a plain ſtriated Texture, and ſometimes has its Surface riſing very beautifully into globular Tubera, or Inequalities, reſembling Cluſters of large Grapes. It is found in *Spain*, *Italy*, *Germany*, *England*, and elſewhere: That of our own Kingdom is very rich in Iron, ſome of it yielding $\frac{12}{20}$ of that Metal, and running into a malleable Iron on the firſt Fuſion.

|| The Nature and Origin of Coral has been as much conteſted as any one Point in natural Knowledge; the Moderns can neither agree

Blood-ſtone, which is of a denſe, ſolid Texture, dry, or, according to its Name, ſeeming as if form'd of concreted Blood: There is alſo another Kind of it, called *Xanthus*, which is not of the Colour of the former, but of a yellowiſh White, which Colour the *Dorians* call *Xanthus*.

LXVII. To theſe may be added [ll]

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with the Antients about it, nor with one another: And there are at this Time, among the Men of Eminence in theſe Studies, ſome who will have it to be of the vegetable, others of the mineral, and others of the animal Kingdom. It were eaſy to overthrow all that has been advanced, as to its belonging to the mineral Kingdom, but that there is not Room here for all one could wiſh to ſay. As no one, however, has been at more Pains to prove it of mineral Origin than our own Dr. *Woodward*, it may not be amiſs here, in few Words, to defend *Theophraſtus*'s φύεται ἐν τῇ θαλάττῃ, againſt that Gentleman's Hypotheſis: and ſhew, as it evidently is ſo, that *Theophraſtus* was in the right, in determining that it was an organized Body; and conſequently the Doctor miſtaken, in imagining it to have been formed in the manner of Foſſils. And this I promiſe myſelf may be done even from his own Account. It τοῦ θ' ὥσπερ λίθος) τῇ χρόᾳ μὲν ἐρυθρὸν, περιφερὲς δὲ, ὡς ἂν ῥίζα. φύεται δὲ ἐν τῇ θαλάττῃ.

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may be proper to premiſe here, that it was of abſolute neceſſity to the ſupporting that Gentleman's Syſtem of the Solution of Foſſils at the Deluge, that this ſhould be proved to be one, becauſe he gives it as a Certainty, that all the foſſile Corals have been in a State of Solution; which, had they ever been of another Nature, they could not, according to his own Syſtem, have been. If his Syſtem be juſt in this Point, I have Proofs, that, whatever he might conclude from it, it really makes for the antient Opinion; for, whatever may have been the Caſe in regard to the foſſile Corals in the Doctor's Cabinet, I have one which I very lately took up from 25 Feet deep in a Clay-pit in the Neighbourhood of *London*: Which ſhews evidently, that it never has been in a State of Solution, and muſt have been therefore, according to his own Syſtem, an organized Body; for there are Numbers of ſmall Balani affixed on it, and that not immerſed in, or laid on it in irregular and uncertain Poſtures (as muſt have been the Caſe, if they had accidentally been lodged in and on it at the Time of its concreting in the Waters of the Deluge) but fixed in the very Manner in which they are found

Coral, for its Subſtance is like that of Stones: Its Colour is red, and its Shape cylindrical, in ſome ſort reſembling a Root. It grows in the Sea.

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when living and in their natural Poſture: This it is impoſſible they ſhould be, if ever they had been diſlodged from it; as they muſt have been, if ever it had been in a State of Solution. Nor are we to imagine, that the foſſile Corals have been in a State of Solution, becauſe they have often very different Matter from the Coralline in their Conſtitution; nay, ſometimes ſeem almoſt wholly compoſed of ſuch: For we frequently find foſſile Wood, which, according to that Gentleman's own Syſtem, never has been in a State of Solution, ſaturated in like manner with the Matter of the common Pyrites, and ſometimes ſeeming wholly compoſed of it. And this very Specimen of Coral of mine, which, it is evident, never has been in a State of Solution, is yet almoſt wholly converted into an Agate.

To this it may be added, that after all the Pains that Gentleman has taken to prove that Corals are Foſſils, and formed by mere Appoſition of Corpuſcles, not by Organization; his chemical Analyſis of red Coral, has brought him to a Neceſſity of allowing, that there is ſomething of another Nature in them: And how can he imagine this came there? When I ξή. Τρόπον δέ τινα οὐ πόῤῥω τούτου τῇ φύσει ϗ ὁ [m] Ἰνδικὸς κάλαμος ἀπολελιθωμένος. Ταῦτα μὲν οὖν ἄλλης σκέψεως.

ξθ. Τῶν δὲ λίθων πολλαί τινες αἱ φύσεις, ϗ τῶν μεταλλευομένων. ἔνιαι γὰρ

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can be informed how ſomething of a vegetable or animal Nature can be produced otherwiſe than from Seed or Egg, I may come over to the Doctor's Opinion; that Corals have been formed by mere Appoſition of Particles waſh'd out of the neighbouring Rocks: But till then muſt believe, that no animal or vegetable Matter can be produced otherwiſe than by organized Growth: nor is there now the leaſt Doubt that they are to be ranged in the animal Kingdom. *Peyſſonell*, *Juſſieu*, and our own acute and excellent *Ellis*, have put this beyond queſtion.

It is matter of great concern to me, that I am obliged in this, and ſome other parts of this Work, to diſſent from the Opinions of the Author above-mentioned, to whom the World owes more real and everlaſtingly true Diſcoveries in the Hiſtory of Foſſils, than to any one Man beſide who ever wrote; and to whom I am myſelf ſo much indebted in this very Work: But Truth is to be ſought for at the Expence of the Opinions of all the Writers in the World; and as Dr. *Woodward* is an Au-

LXVIII. The [m] petrified *Calamus Indicus* alſo, is not very different from this. But theſe are more properly the Subjects of a different ſet of Obſervations.

LXIX. Beſide theſe there are alſo many Kinds of metalline Stones, ſome

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thor ſo much and ſo deſervedly eſteemed, whereever he is in Errors, few would venture to believe him ſo, unleſs convinced of it, either by ocular Demonſtration, or the apparent Teſtimony of the Antients. Where theſe have made againſt him, there, and there alone, I have ventured to diſſent from him: and I cannot but obſerve, that he has, in this Caſe of the Corals, been guilty of that Precipitancy of which he ſo angrily accuſes ſome other excellent Authors: And when he ſo ſeverely cenſured in this matter, in which himſelf was in the wrong, a Gentleman to whom the World is very much indebted in things of this Kind, he ſhould have conſidered that it might be his own Fate to be afterwards treated in the ſame manner; and remembered the excellent *Spaniſh* Proverb, which adviſes a Man who has Glaſs Windows never to throw Stones.

[m] The petrified *Calamus Indicus* of the Antients, was one of the ſtarry-ſurfaced foſſile Coralloids; and, indeed, was not named without ſome appearance of Reaſon: The Speci-

ἅμα [n] χρυσὸν ἔχουσι ϗ ἄργυρον, προφανὲς δὲ μόνον ἄργυρον· βαρύτεραι δ᾽ αὗται πολὺ ϗ τῇ ῥοπῇ ϗ τῇ ὀσμῇ.

ό. Καὶ [o] Κυανὸς αὐτοφυὴς, ἔχων ἐν

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men I have of it, very prettily and exactly reſembles that Body.

[n] The Gold and Silver Ores are of ſo many Kinds, and ſuch various Appearances, that it is an almoſt endleſs Scene of Variety that may be found in viſiting the various Mines, or examining the Specimens from them. Gold, *Woodward* obſerves, is, more or leſs of it, incorporated with almoſt all kinds of terreſtrial Bodies: And Silver I have ſeen in almoſt an infinite variety of Forms. That of *Saxony* is incorporated generally with Sulphur and Arſenick, and has from them an external Shew of Gold, for which Reaſon it is called there *Rotgulden Ertz*, that is, Red-golden-looking Ore: This is very heavy, and when broken is of a ſtrong Smell.

Beſide theſe, the common Marchaſites and Pyritæ many of them hold Gold and Silver in ſmall Quantities; and are of various Colours, and contain ſulphureous, arſenical, and other different Matter, enough to give them both Smell and Weight, and ſometimes both, to a very great Degree.

of which contain both [n] Gold and Silver, though the Silver alone is viſible; and theſe are very remarkable, both for their Weight and Smell.

LXX. As alſo the native Blue, or [o] *La-*

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[n] The Κυανὸς or Cyanus here mentioned, is not the blue Gem before deſcribed under that Name, but the blue Colour uſed by Painters, and ſince called *Lapis Armenus*, by which Name alone it is now known. The *Greeks* called this and the Gem both by the common Name Κυανὸς, Cyanus: They had no other Name for this, but generally took care to diſtinguiſh which they meant, by the Context. It is here evident by its Epithet αὐτοφυὴς, by way of diſtinction from the artificial *Cæruleum* uſed in Paintings; (for the Cyanus Gem, or *Lapis Lazuli*, cannot be ſuppoſed to have been ſo ſubject to be counterfeited) and its containing their Chryſocolla, which the *Lapis Armenus* always does, that the Paint, and not the Gem, was the Cyanus meant here. The Antients calling theſe two different Subſtances by the ſame Name, has, however, been the Occaſion of innumerable Confuſions and Miſunderſtandings of their Works; and that not only among the leſs careful of the Moderns, but even among ſome of their earlieſt Copiers: And we are not to wonder if many are at preſent miſled,

ἑαυτῷ χρυσοκόλλαν. ἄλλη δὲ λίθος, ὁμοία τὴν χρόαν τοῖς [p] ἄνθραξι. βάρος δ' ἔχουσι.

οά. Τὸ ὅλον δὲ ἐν τοῖς μετάλλοις πλεῖσται ϗ ἰδιώταται φύσεις εὑρίσκονται τῶν τοιούτων. ὧν τὰ μέν εἰσι γῆς, καθάπερ [q] Ὦχρα, καὶ Μίλτος. τὰ δ' οἷον

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as it is now generally thought going very far back if we turn to *Pliny*; when we find that even *Pliny*, who has taken the greater Part of his Hiſtory of Foſſils from this Author, has in many Places evidently and notoriouſly miſunderſtood him. Of this we have an evident Inſtance in the preſent Caſe; for he has confounded the two Subſtances called by this Name, and ſaid of the Gem Cyanus, what *Theophraſtus*, from whom he tranſlated it, ſays of the Paint; as I ſhall have Occaſion to obſerve at large, when I come hereafter to the Paſſage from which *Pliny* tranſlated it.

The Cyanus here meant, therefore, is the *Lapis Armenus*, called by the *Germans*, *Bergblau*, and by the *French*, *Verd azur*. It is a mixt earthy Subſtance, of a beautiful greeniſh Blue; and ſeems compoſed of arenaceous and ochreous Matter, tinged to that Colour by Particles of Copper. It was firſt found in *Armenia*, *pis Armenus*, which has in it Chryſocolla; and another Stone, in Colour reſembling the [p] Carbuncle, but much heavier.

LXXI. Upon the whole, there are many and very remarkable, different Kinds of foſſile Subſtances dug in Pits; ſome of which conſiſt of an argillaceous Matter, as [q] *Ochre*, and *Reddle*; others

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from whence it has its preſent Name, and uſed to be brought from thence; but has ſince been diſcovered in *Germany*, *Bohemia*, *Saxony*, and many other Places: Our own Kingdom produces it, and that as good as any in the World, but in what Quantity I cannot ſay. I remember to have ſeen it in the Fiſſures of Stone, among ſome of the Talcs, not far from *Mountſorrel* in *Leiceſterſhire*, and have now ſome of it, which I brought thence.

[p] The Stone next mentioned, and ſaid to reſemble the Carbuncle, but to be heavier, was probably of the Cinnabar Kind, of which hereafter: Many Specimens of this Foſſil I have ſeen of a very fine Texture, and beautiful Colour; and all of it has the other Quality here mentioned, Weight.

[q] Ochre and Reddle are Earths of the ſame Nature and Texture, and only differ in Colour;

ἄμμȣ, καθάπερ χρυσοκόλλα, ϗ κυανός. τὰ δὲ κονίας, οἷον [r] Σανδαράκη, καὶ Ἀῤῥενικὸν, ϗ ὅσα ὅμοια τȣ́τοις.

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there are many Kinds of each, ſeveral of which will be ſpoken of hereafter: They are all of a fine argillaceous Texture, moſt of them eaſily crumbling to pieces, and ſtaining the Fingers in handling. They are uſed in Medicine and by the Painters. The common yellow Ochre is a cheap and very uſeful Colour: And the common Reddle is often ſold in the Druggiſts Shops either in its native State, if pale enough, as it ſometimes is; or mixed with Whiting, under the Name of Bole Armeniac.

The Ochres all contain more or leſs Iron; for the yellow ones become red by burning.

[r] Sandarach and Orpiment are alſo two Subſtances of the ſame Nature and Texture, differing in Colour, like the Ochre and Reddle; and, in like manner, the yellow will become red by burning.

Orpiment is the Ἀῤῥενικὸν of the antient, and Ἀρσενικὸν of the later *Greeks*. The *Arabians* call it *Zarnich Asfar:* It is a very beautiful Subſtance, compoſed of large Flakes, reſembling thoſe of the *Lapis Specularis*, but of a glorious Yellow; very weighty, and ſometimes holding a ſmall Quantity of Gold.

of a ſandy, as *Chryſocolla* and the *Lapis Armenus*; and others as it were of Aſhes, as [r] *Sandarach*, *Orpiment*, and others of that Kind.

There are, beſide this fine Orpiment, two other leſs beautiful Kinds; the one compoſed of an impurer Subſtance, reſembling common Sulphur, ſpangled all over with ſmall Flakes of the fine foliaceous Kind; the other more impure than the laſt, and tinged of a paler or deeper Green in many Places, from Particles of Copper. Theſe are what may be called the three different Kinds of this Foſſil; but there are, beſide theſe, almoſt endleſs Varieties of it, in regard to its deeper or paler Colour, and the extraneous Matters contained in it.

Yellow Orpiment burns to a Redneſs in the Fire, emitting a nauſeous Smell; and this red Maſs is ſometimes called red Orpiment: But the genuine and natural red Orpiment is the Sandarach here mentioned; this the *Arabians* call *Zarnich-Ahmer*; it is of the ſame Nature with the former, but generally in larger Maſſes, and not of that foliaceous Texture, but in more compact Glebes.

All the Kinds of Orpiment and Sandarach are found in the Mines of Gold, Silver, and Copper; and ſometimes two or more of them

οβ΄. Καὶ τῶν μὲν τοιούτων ϖλέιους ἂν τις λάβοι τὰς ἰδιότητας. ἔνιαι δὲ λίθοι ϗ τὰς τοιαύτας ἔχουσι δυνάμεις, εἰς τὸ μὴ ϖάσχειν, ὥσπερ εἴπομεν. οἷον τὸ μὴ γλύφεται σιδήροις, ἀλλὰ λίθοις ἑτέροις [f].

ογ΄. Ὅλως μὲν, ἡ κατὰ τὰς ἐργασίας ϗ τῶν μειζόνων λίθων ϖολλὴ διαφορά. ἄλλοι ϖριστοὶ γάρ· οἱ δὲ γλυπτοὶ, καθάπερ ἐλέχθη, ϗ τορνευτοὶ τυγχάνουσι, καθάπερ ϗ ἡ [t] Μαγνῆτις αὐτὴ λίθος, ἡ ϗ

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mixed in the ſame Glebe. I have, from the Mines of *Goſſelear* in *Saxony*, a moſt elegant Piece of the foliaceous Orpiment, which has two fine Veins of native Sandarach running acroſs it: It was brought to me under the Name of a Gold Ore; and I believe really does contain a ſmall Quantity of that Metal.

[f] This is a Doctrine well known to our Lapidaries, and without the Knowledge of which the Diamond, the firſt and fineſt of all Gems, never could have been worked into Form at

LXXII. Many other Properties there alſo are in theſe Subſtances which are eaſily obſerved. As that ſome of the Stones before named are of ſo firm a Texture, that they are not ſubject to Injuries, and are not to be cut by Inſtruments of Iron, but only by other Stones [f].

LXXIII. On the whole, there is a great Difference in the Texture of the larger Stones; as may be learnt from the different Manners in which they may be worked; ſome may be cut, others engraved on, and ſhaped, as before obſerved, by the Turner's Inſtruments, as the [t] Magnet Gem, a Stone of very ele-

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all; for nothing will cut it but itſelf. Other Gems and Stones are either work'd with Diamond-powder, or with that of Emery, one of the hardeſt Subſtances in Nature, except the Diamond; and afterwards with Tripoly, and other ſofter Powders.

[t] The Magnet Gem, or Μαγνῆτις λίθος of the antient *Greeks*, I have before obſerved, was a Stone of an entirely different Nature from the Loadſtone, which we now call the Magnet. The Stone here meant, was a very bright white

ὄψει περιττὸν ἔχουσα· ϗ, ὥς γε δή τινες θαυμάζουσι, τὴν ὁμοίωσιν τῷ ἀργύρῳ μηδαμῶς οὖσαν συγγενῆ.

οδʹ. Πλείους δ' εἰσὶν οἱ δεχόμενοι πάσας τὰς ἐργασίας. ἐπεὶ καὶ ἐν [v] Σίφνῳ τοιοῦτός τις ἐστὶν ὀρυκτός. ὃς τρία στάδια ἀπὸ θαλάττης, στρογγύλος ϗ βολώδης, ϗ τορνεύεται, ϗ γλύφεται διὰ τὸ μαλακόν.

Subſtance, ſo nearly reſembling Silver in Appearance, that it was ſcarce, at firſt Sight, to be diſtinguiſhed from it: It was found in large Maſſes, and was of a Texture eaſily to be wrought into any Shape or Figure. This made it in great Eſteem among the Antients, and in conſtant Uſe, turned into Veſſels of different Kinds. What Stone it was, is at preſent not to be certainly determined, farther than that it was of the Ollaris Kind; probably it may be now loſt; at leaſt among the Nations we have Commerce with.

What I have before obſerved of the Antients calling this ſilvery Stone the Magnet, and our Loadſtone the *Heraclius Lapis*, is confirmed, in very plain Words, by *Heſychius*, Μαγνῆτις

gant Appearance, and much admired by many: This carries a fine Reſemblance of Silver, though it is in Reality a Stone of an entirely different Kind.

LXXIV. Many alſo there are, which admit all Kinds of working; as in [v] *Siphnus* there is a foſſile Subſtance of this Kind, which is dug in Lumps, and roundiſh Maſſes, at about three Furlongs Diſtance from the Sea: This may at firſt be either engraved on, or worked by the Turner into any Form, by reaſon of

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λίθος, αὕτη πλανᾷ τὴν ὄψιν ἀργύρῳ ἐμφερὴς οὖσα, ἡ δὲ Ἡρακλεῶτις τὸν σίδηρον ἐπισπᾶται.

[v] This Stone was afterwards called *Lapis Siphnius,* from the Place where our Author obſerves it was found, which was an Iſland in the *Ægean Sea,* called by ſome *Merope.* What the Antients in general have left us about it beſide, is, that it was of Strength to bear the Fire. And Veſſels made of it, ſerved, as thoſe of Earthen-ware, for the common Offices of Boiling, *&c.* *Pliny* ſums up their Accounts of it in theſe Words: *In Siphno Lapis eſt qui cavatur, tornaturque in vaſa coquendis cibis utilia, vel ad eſculentorum uſus:* and a little afterwards, *Sed in Siphnio ſingulare quod, excalfactus, oleo nigreſcit dureſcitque, natura molliſſi-*

ὅταν δὲ πυρωθῇ (ϗ ἀποβαφῇ) τῷ ἐλαίῳ, μέλας τε σφόδρα γίνεται, καὶ σκληρός. ποιοῦσι δ' ἐξ αὐτοῦ σκεύη τὰ ἐπιτράπεζα.

οέ. Οἱ μὲν τοιοῦτοι πάντες ὑποδέχονται τὴν τοῦ σιδήρου δύναμιν. ἔνιοι δὲ λίθοις ἄλλοις γλύφονται, σίδηρος δ' οὐ δύναται. καθάπερ εἴπομεν. οἱ δὲ σιδήροις μὲν ἀμβλέσι δὲ ϗ εἰσιν, ὥστε [w] παραπλησίως δὲ κατὰ τὸ μὴ τέμνεσθαι σιδήρῳ.

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mus. I have, among the Ollares, one of the coarſe grey and black Kind; the *Pierre Ollaire a gros Graines* of *Bomare*; which becomes of a perfect black after it has been two or three Times in the Fire. Perhaps this is the very Stone which *Pliny* ſpeaks of here. I had mine from *Minorca*.

[w] The Marbles, Alabaſters, and moſt other Stone of Strata, are of the Number of thoſe which we cut with blunt Iron Inſtruments. But if we conſider our Manner of performing this, which probably is the ſame that was uſed in this Author's Time, and is not with-

its Softneſs; but when it is afterwards burnt and wetted with Oil, it becomes black and ſolid. Veſſels of different Kinds, for the Service of the Table, are made of this.

LXXV. All Subſtances of this Kind are to be worked on by Iron Inſtruments; but others there are, which, as before obſerved, will not be touched by them, but muſt be cut by other Stones; and others yet, which may be cut with Iron, but the Inſtruments muſt be dull and blunt[w]: Which is much as if they were not cut by Iron.

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out the Aſſiſtance of Water and Sand, we ſhall find, that theſe are not properly to be divided from the Claſs of thoſe uſually cut with other Stones; for, in reality, the Sand in this Caſe does more than the Iron, and is a ſimilar Subſtance to the Powder of hard Stones uſed to Gems; tho' coarſer. The Art of cutting and poliſhing the harder Gems with other Stones was known very early in the World: We have Accounts from ſome of the earlieſt Authors, of Fragments of Diamonds being ſet in a convenient Manner for handling, and made into Tools for the working on other Gems. Diaοϛ΄. Καί τοι ϗ ϛερεώτερα ϗ ἰσχυρότερα τέμνει ϗ σίδηρος, λίθȣ σκληρότερος ὤν.

οζ΄. Ἄτοπον δὲ κἀκείνῳ φαίνεται· διότι ἡ μὲν ἀκόνη κατεσθίει τὸν σίδηρον. ὁ δὲ σίδηρος ταύτην μὲν δύναται διαίρειν

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mond-powder is the great Thing in Uſe with us on theſe Occaſions, and next to it Emery; and Emery was alſo known to the Antients, and uſed by them on the ſame Occaſions. *Σμίρις λίθος ἐϛὶν ᾗ τὰς ψήφȣς οἱ δακτυλιογλύφοι σμήχȣσι.* Dioſcorides. *Σμίρις ἄμμȣ εἶδος, ᾗ σμήχονται σκληροὶ τῶν λίθων.* Heſychius.

Cardanus imagines, but erroneouſly, that the Porus of the Antients was our Emery; or elſe, that our Emery was unknown to them; which is no leſs an Error: For it is evident, they were well acquainted with its Uſes. And as to what he adds, of their working on Gems with the Porus, and Fragments of the *Lapis Obſidianus*, *Salmaſius*, who had certainly read more than moſt Men, affirms, he never could find any Account of it among them. *Pliny*

LXXVI. Iron, however, being harder in its Texture than Stone, will cut ſuch as are both harder and more ſolid than theſe.

LXXVII. There ſeems, however, yet an Abſurdity in this, ſince the Whetſtone has Power upon, and takes off a Part of the Iron Inſtruments which are ſharpened on it, and the Inſtrument may be made to cut and work upon the Whetſtone; but notwithſtanding,

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relates, indeed, that Fragments of the harder Kind of the *Oſtracites* were uſed for this Purpoſe; *lib.* 37. *c.* 10. *Oſtracia ſeu Oſtracites eſt teſtacea durior: altera Achatæ ſimilis niſi quòd Achates politura pingueſcit; duriori tanta ineſt vis ut aliæ gemmæ ſcalpantur fragmentis ejus.* And that a Sand prepared from the Porus, was uſed for poliſhing Marble, but not Gems; *Craſſior enim harena laxioribus ſegmentis terit, & plus erodit marmoris, majuſque opus ſcabritie politura relinquit. Rurſus Thebeicia polituris accommodatur, & quæ fit e poro lapide aut e pùmice.* For *poro lapide,* many of the Copies have *toro lapide,* and *duro lapide;* but the concurrent Accounts of other of the Antients determine it to be this particular Stone that is meant. And the ſame Author expreſsly ſays,

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ϗ ῥυθμίζειν, ἐξ ἧς δ' αἱ σφραγίδες, οὔ. ϗ πάλιν, ὁ λίθος, ᾧ γλύφουσι τὰς σφραγίδας, ἐκ τούτου ἐστὶν ἐξ οὗπερ αἱ ἀκόναι, ἢ ἐξ ὁμοίου τούτῳ. ἄγεται δ' ἡ ἐξ Ἀρμενίας[x].

οή. Θαυμαστὴ δὲ φύσις καὶ τῆς βα-

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that the *Obſidianus* could not cut the true Gems, *Obſidianæ fragmenta veras gemmas non ſcarifant*.

[x] The *Armenian* Whetſtones, *Coticulæ* of the *Latins*, and 'Ακόναι of the *Greeks*, were of a Stone of extreme Hardneſs; and, as we may learn from this Paſſage, of the ſame Nature with that, which they uſed for the working ſome of thoſe Stones which Iron could not touch.

This Stone uſed for working on others they firſt had from *Cyprus*; and ſome of the antient *Greeks* called it *Adamas*, from its extreme Hardneſs; as they alſo did ſometimes Iron, for the ſame Reaſon. This Manner of Writing has much miſled their Copiers; and even *Pliny*, who, after having in one Place given the right Account of this Stone, and called it *Cos*, in another miſtakes it for a Diamond, and calls it ſuch. This was the Effect of his copying from various Authors in different Parts of his will not cut thoſe Gems which are work'd into Seals; tho' the Stone with which they are worked is compoſed of the ſame Kind of Matter with the Whetſtone, or ſomething not very unlike it. Theſe Stones are from *Armenia* *.

LXXVIII. The Nature of the Stone

Work; and not ſeeing, in many Places, that they were deſcribing only the ſame Subſtance under two different Names. This *Cyprian* Stone was long in Eſteem, and ſerved not only for poliſhing, but boring Holes through ſuch Gems as they ſtrung on Threads, to wear for Bracelets, and other the like Ornaments. But After-ages found out the *Armenian*, which proving much harder than it, became more generally uſed, and at length entirely baniſhed the other. That this *Armenian* was of the ſame Kind with their Ἀκόναι, is evident from this Paſſage of *Theophraſtus*; and that it had the Properties of the *Cyprian*, and was uſed as it, is plain from *Stephanus*'s Account of it, *παρέχονται δὲ λίθον τὴν γλύφουσαν καὶ τρυπῶσαν τὰς σφραγῖδας.* *Pliny*'s Account of other Gems being bored by *Cyprian* Diamonds, means no more, than that they were wrought by a Stone of the Nature of the Ἀκόνη, brought from *Cyprus*.

σανιζούσης τὸν [y] χρυσόν. δοκεῖ γὰρ δὲ τὴν τοιαύτην ἔχειν τῷ πυρὶ δύναμιν, καὶ γὰρ ἐκεῖνο δοκιμάζει. διὸ ϗ ἀποροῦσί τινες, οὐκ ἄγαν οἰκείως ἀποροῦντες. οὐ γὰρ τὸν αὐτὸν τρόπον δοκιμάζει. ἄλλα τὸ μὲν πῦρ τῷ τὰ χρώματα μεταβάλλειν, ϗ ἀξιοῦν. ὁ δὲ λίθος, τῇ παρατρίψει. δύνασθαι γὰρ, ὡς ἔοικεν, ἐκλαμβάνειν τὴν ἑκάστου φύσιν.

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[y] The Stone here deſcribed is the *Lapis Lydius* of the Author, commonly called the Touch-ſtone, from its Office of trying Metals by the Touch. The excellent *Salmaſius*, generally ſo happy in underſtanding the Antients, and to whom I am obliged, in the Courſe of this Work, much oftener than to any other Author, is yet guilty of a Miſtake in regard to this Stone; and erroneouſly accuſes *Pliny* of a great Error, in a Thing in which that Author, however often faulty, is perfectly right. Miſtakes in the Works of Men of ſuch Emi-

which tries [y] Gold, is alſo very wonderful, as it ſeems to have the ſame Power with Fire; which is alſo a Teſt of that Metal. Some People have, for this Reaſon, queſtioned the Truth of this Power in the Stone; but their Doubts are ill founded, for this Trial is not of the ſame Nature, or made in the ſame Manner with the other. The Trial by Fire is by the Colour, and Quantity loſt by it; but that by the Stone, is made only by rubbing the Metal on it; the Stone ſeeming to have a Power of receiving ſeparately the diſtinct Particles of different Metals.

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nence as this excellent Critic, ought, above all Things, to be ſet right; as they otherwiſe paſs with the Generality of Readers as certain and unqueſtionable Truths. And this, in particular, being in the Name of a Stone, ought to be cleared rather than any other; as Errors about Names are what alone have given more than half the Confuſion we have, in regard to the Works of the Antients. *Pliny* has ſaid of this Stone, *Auri argentique mentionem comitatur lapis, quem coticulam appellant, quondam non ſolitus inveniri niſi in flumine Tmolo, ut auctor eſt*

οθ΄. Εὑρῆσθαι δέ φασιν νῦν ἀμείνω ϖολὺ τῆς ϖρότερον. ὥστε μὴ μόνον τὸν ἐκ τῆς καθάρσεως, ἀλλὰ καὶ τὸν χαλκὸν κατάχρυσον, καὶ ἄργυρον γνωρίζειν, καὶ ϖόσον εἰς τὸν στατῆρα μέμικται. σημεῖα δ᾽ ἐστὶν αὐτοῖς ἀπὸ τοῦ ἐλαχίστου. ἐλάχιστον δὲ γίνεται κριθὴ, εἶτα κόλυβον. εἶτα τεταρτημόριον, ἢ ἡμιόβολος. ἐξ ὧν γνωρίζουσι τὸ καθῆκον.

Theophraſtus: nunc vero paſſim, quem alii Heraclium, alii Lydium vocant. On which *Salmaſius's* Remark is this, *Fallitur Plinius peccatque non mediocriter. Lapis hic Lydius quo aurum & argentum probatur, nunquam dictus eſt Heraclius, ſed ille alter Lydius qui ferrum rapit.* I am ſorry to ſay it, but it is *fallitur Salmaſius*, not *Plinius*; for we need look no farther than this Author to know, that *Heraclius* was as common a Name for the Touchſtone among the Antients, as for the Loadſtone: See *p.* 24, where he expreſsly ſays, that the Touchſtone

LXXIX. It is ſaid alſo, that there is a much better Kind of this Stone now found out, than that which was formerly uſed; inſomuch, that it now ſerves not only for the Trial of the refined Gold, but alſo of Copper or Silver coloured with Gold; and ſhews how much of the adulterating Matter by Weight is mixed with Gold: This has Signs which it yields from the ſmalleſt Weight of the adulterating Matter, which is a Grain, from thence a Colybus, and thence a Quadrans or Semi-Obolus; by which it is eaſy to diſtinguiſh if, and in what Degree, that Metal is adulterated.

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was ſo called, *εἰ δὲ βασανιζειν τὸν ἄργυρον ὥσπερ ἥτε καλουμένη λίθος Ἡράκλεια καὶ ἡ Λυδη.* The Loadſtone and Touchſtone were therefore both called among the Antients, from their common Country, *Lapis Lydius*, and *Lapis Heraclius*. And for that Reaſon there have been great Errors in regard to them, in many of the leſs careful Writers ſince: As about the two Cyanus's, and, in ſhort, all the Subſtances which they had thus confuſed, in not allowing them particular Names. It has ſince been called *Lapis Baſanites*, from its Uſe in trying

πʹ. Εὑρίσκονται δὲ τοιαῦται πᾶσαι ἐν τῷ ποταμῷ [z] Τμολῷ. λεία δ' ἡ φύσις αὐτῶν ϗ ψηφοειδὴς, πλατεῖα, οὐ στρογγύλη. μέγεθος δὲ ὅσον διπλασία τῆς μεγίστης ψήφου. διαφέρει δ' αὐτῆς πρὸς τὴν δοκιμασίαν τὰ ἄνω πρὸς τὸν ἥλιον, ἢ τὰ κάτω. καὶ βέλτιον δοκιμάζει τὰ ἄνω. τοῦτο δέον, ὅτι ξηρότερα τὰ ἄνω. κωλύει γὰρ ἡ ὑγρότης εἰς τὸ ἐκλαμβάνειν. ἐπειδὴ ϗ ἐν τοῖς καύμασι τὸ δοκιμάζειν χεῖρον.

Metals; *Chryſites*, from its particular Efficacy in Trial of Gold; and *Coticula*, becauſe it was generally formed, for Conveniency, into the Shape of a ſmall Whetſtone. We are not to ſuppoſe, however, that this Stone alone ſerves for that Purpoſe; in *Italy* a green Marble, called there *Verdello*, is now generally uſed in its ſtead; and in moſt other Places the *Ba-*

LXXX. All theſe Stones are found in the River [z] *Tmolus*; their Texture is ſmooth, and like that of Pebbles; their Figure broad, not round; and their Bigneſs twice that of the common larger Sort of Pebbles. In their Uſe in the Trial of Metals, there is a Difference in Power between their upper Surface, which has lain toward the Sun, and their under, which has been to the Earth, the upper performing its Office the more nicely; and this is conſonant to Reaſon, as the upper Part is the dryer; for the Humidity of the other Surface hinders its receiving ſo well the Particles of the Metals: For the ſame Reaſon alſo it does not perform its Office ſo well in hot Weather

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ſaltes, a black Marble, found in regularly ſhaped Columns, many placed together, as in *Ireland*, where a Quantity of it is called the Giants Cauſeway.

[z] The true *Lydius* was originally found only in this River, afterwards in many other Places; and at preſent is very plentiful in many of the larger Rivers of *Germany*. This Author gives

ἀνίησι γάρ τινα νοτίδα ἐξ αὐτῆς. δι' ἣν ἀπολιθαίνει. συμϐαίνει δὲ τοῦτο ϗ ἄλλοις τῶν λίθων. ϗ ἐξ ὧν τὰ ἀγάλματα ϖοιοῦσιν. ὃ ϗ σημεῖον ὑπολαμϐάνει ὡς ἴδιον τὸ τοῦ ἔδους.

πά. Αἱ μὲν οὖν τῶν λίθων διαφοραὶ, ϗ δυνάμεις σχεδόν εἰσιν ἐν τούτοις.

πϐʹ. Αἱ δὲ τῆς γῆς ἐλάττονες μὲν, ἰδιώτεραι δέ.

πγʹ. Τὸ μὲν [a] τήκεσθαι, ϗ ἀλλοιοῦσθαι,

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a very circumſtantial Account of the Property of this Stone; and they had in his Time very good ones, and knew very well how to uſe them, if they could do what he ſays with them. The true *Lydius*, tho' perfectly black, is a real Kind of Serpentine. Its Structure is the very ſame with the common green and white Serpentine; and there is a green and black one, the black Parts of which are perfectly like it.

as in colder, for in the hot it emits a Kind of Humidity out of its Subſtance, which runs all over it: This hinders the metalline Particles from adhering perfectly, and makes Miſtakes in the Trials. This Exſudation of a humid Matter is alſo common to many other Stones; among others, to thoſe of which Statues are made; and this has been looked on as peculiar to the Statue.

LXXXI. Theſe then, in general, are the Differences, and particular Qualities of Stones.

LXXXII. Thoſe of Earths are fewer, indeed, but they are alſo more peculiar.

LXXXIII. [a] Earth is ſubject to be

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[a] The Author now enters on an Account of the various Earths. The Differences of which are, indeed, very eſſential. It is to be obſerved, that he ſets out in his uſual Manner, juſtly, and philoſophically. The two great Characteriſtics of Earths, are their eaſy Diffuſibility in Water, and Concretion and Induration on being ſeparated from it; and their being fuſible by Fire. The firſt of theſe Qualities eſſentially diſtinguiſhes them from moſt

ϗ πάλιν ἀποσκληρύνεσθαι, ϗ ταύτῃ συμβαίνει· τήκεται μὲν γὰρ τοῖς χυτοῖς ϗ ὀρυκτοῖς, ὥσπερ ϗ ὁ λίθος. μαλάττεται δὲ, πλίνθους τε ποιοῦσιν, ὧν τάς τε ποικίλας, ϗ τὰς ἄλλας τὰς συντιθεμένας. ἁπάσας γὰρ πυροῦντες ϗ μαλάττοντες, ποιοῦσιν.

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other Foſſils: The other they have in common with Stones; and, indeed, with almoſt all other foſſile Bodies whatever. It was impoſſible for our Author to have known this, unleſs he had had our Aſſiſtances. But we find by Experiments with powerful Burning-glaſſes, that in a manner all foſſile Subſtances, as well as Earths, are fuſible and vitrifiable.

Earths, determinately ſpeaking, are opake Bodies, diffuſible by Water, and vitrifiable by extreme Heat; friable when dry, not inflammable, and generally inſipid to the Taſte: Not that theſe are certain, univerſal Characteriſtics, and liable to no Exceptions. Whatever may be the Caſe in the Vegetable and Animal Kingdoms, it is the Miſfortune in the Study of foſſile Bodies, that ſuch has been the Confuſion and Intermixture of their conſtituent Particles at the general Deluge, that there are none ſuch to be eſtabliſhed in them; for liquated, altered from its original State and Conſiſtence, and afterwards indurated again. It will melt, as Stones, with fuſible and foſſile Subſtances; and is ſoftened, and made into Bricks: Theſe are of various Kinds, and compoſed in various Manners, but are all made by moiſtening and burning.

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there are ſo many heterogene Particles, of a thouſand different Kinds, mixed even with the ſame Foſſil in different Places, that there is no determining to any Certainty, even its Manner of Variation from its pure State. What I have given may paſs, however, for a general Character of what, in Treatiſes of Foſſils, we mean by the Word *Earths*; which may be afterwards diſtinguiſhed into *Clays*, *Ochres*, *Boles*, *Marles*, *Chalks*, and *Loams*. Sand, and the common vegetable Mould, which ſome give a Place in the Catalogues of Earths, have of right no Buſineſs among them; for the firſt is only either a ſmaller kind of Gravel, conſiſting of an infinite Number of ſmall Pebbles of different Shapes and Colours; or the conſtituent Particles of the Stone of Strata or other Bodies accidentally looſe: and the latter owes its preſent Mode of Exiſtence, in a great meaſure, to putrified animal and vegetable Subſtances of a πδʹ. [b] Εἰ δὲ ϗ ὁ ὕελος ἐκ τῆς ὑελίτι-

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thouſand Kinds; and is, diſtinctly ſpeaking, no genuine Foſſil.

In order to the rightly underſtanding what is meant by the calling any Subſtance by either of the other Names, it may not be improper briefly to give their ſeveral Diſtinctions, ſo far as the general Uncertainty of the Foſſile Kingdom will permit.

1. *Clays* are Earths compoſed of very fine Parts, ſmooth, heavy, not eaſily mixing with Water; and when mixed, not readily ſubſiding in it; compact, viſcid, and leaving a fatty Impreſſion on the Tongue: ſoft while in the Stratum, and hardening by Fire into a kind of ſtony Texture.

2. *Ochres* are ponderous earthy Subſtances, more fat than Chalk, and leſs ſo than Clay, readily diffuſible in Water, and friable when dry, ſtaining the Fingers in handling, and principally differing from the Boles, in that they are of a looſer Texture.

3. *Boles* are ponderous earthy Subſtances, more fat than Chalk or Marle, but leſs ſo than Clay; ponderous, of an aſtringent Taſte, melting in the Mouth, ſtaining the Fingers; and generally partaking more or leſs of the Nature of Iron; as indeed, in ſome Degree, do moſt, if not all, the other Earths, but the Boles generally more than any.

LXXXIV. [b] But if Glaſs be made, as

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4. *Marles* are light friable Subſtances, of a middle Nature between Clay and Chalk, not ſo fatty as the former, nor ſo denſe as the latter, eaſily diffuſible in Water, and, when taſted, dry, inſipid, and adhering to the Tongue.

5. *Chalks* are earthy Subſtances, denſe, brittle, readily diffuſible in Water, and quickly ſeparating themſelves from it by Subſidence, ſtaining the Fingers in handling, and, in taſting, ſticking to the Tongue.

6. And *Loams* are earthy Bodies, of a denſe, rough Texture, conſiſting of clayey or ochreous Matter, with arenaceous Particles of various Figures, Sizes, and Colours, immerſed in and intimately mixed with it.

Much more might be ſaid on this Occaſion, were this a proper Place for it; but a general and ſuccinct Account of what is meant by the general Names of Clays, *&c.* may be ſufficient for what is intended in this Place; which is only to give ſomething of a determinate Idea of what is meant by the Words Chalk, Bole, *&c.* when there ſhall be Occaſion hereafter to ſay any of the Bodies deſcribed by this Author is of the Nature of one or other of theſe Subſtances.

[b] All Earths are vitrifiable by extreme Degrees of Heat. Nothing is more certain, than that the Vitrification, or converting the Subſtances of which Glaſs is made, into that Form,

δος, ὡς τινές φασι, ϗ αὕτη πυρώσει γίνεται. ἰδιωτάτη δ' ἡ τῷ χάλικι μιγνυμένη. πρὸς γὰρ τὸ τήκεσθαι ϗ μίγνυσθαι, ϗ δύναμιν ἔχει περιττὴν, ὥστε τὸ κάλλει τῆς χρόας ποιεῖν διαφοράν.

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is the Effect of the extreme Force of Fire; and that the beſt ſort of Glaſs is that in the making of which Flints have been uſed, is a Truth as much known now, as it was in the Days of *Theophraſtus*.

The Things of which our Glaſs is made, are, Pot-aſhes, ſome ſtony, arenaceous, or cryſtalline Matter, as Sand, Flints, or Cryſtal; and Manganeze, a ferrugineous Subſtance: To which ſome add a ſmall Quantity of pure Salt of Tartar: Theſe Ingredients are calcined into what the Workmen call Fritt; and afterwards run, by Violence of Fire, into Glaſs of different Colours and Degrees of Purity, according to the different Ingredients.

The Glaſs of the Antients was, in the different Ages of the World, in different Degrees of Purity and Excellence, according to the Ingredients of which they made it; which were as ſome affirm, of the *Uelitis*, a vitrifiable Sand, it owes its Production to the extreme Force of Fire: The beſt is that, in the making of which Flints have alſo been uſed; for beſides that they melt and mix with the running Maſs, they have a peculiar Excellence in the making the Glaſs, inſomuch that they give the Differences in the Clearneſs of the Colour.

Sand, Natrum, and Flints. Sand was the firſt Ingredient ever uſed or thought of for the making Glaſs; and for many Ages, there was even no other Sand uſed among the *Greeks* than that found clean waſhed on the Banks and in the Beds of Rivers, and this, from its Uſe, might very probably acquire the Name of *Uëlitis*, or Glaſs-ſand.

In the beginning of this Sentence, the other Copies of this Author have ὑέλιδος. I have ventured to follow *Salmaſius* in his moſt rational Opinion, that it was in the Original ὑελίτιδος, and a little afterwards to give χάλικι, for what has hitherto ſtood χάλκῳ, according to *De Laet*; who very juſtly ſuſpects, that Flints were much more likely to be made an Ingredient in Glaſs than Braſs. And, indeed, when we conſider the many Chaſms and greater Erπέ. Περὶ δὲ Κιλικίαν, [b] ἐστὶ τὶς ἣ ἕψουται γῆ, ϗ γίνεται γλισχρά. ταύτῃ δ᾽ ἀλείφουσι τὰς ἀμπέλους ἀντὶ ἰξοῦ ϖρὸς τοὺς ἶπας.

πϛ´. Εἴη δ᾽ ἂν [c] λαμβάνειν ϗ ταύτας τὰς διαφορὰς ὅσαι ϖρὸς τὴν ἀπολίθωσιν

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rors in the Copies of this Author, we cannot wonder that ſuch as theſe have been paſſed over, which were only Errors in a Letter or two.

[b] The *Cilician* Earth, uſed as a Preſerver of Vines from Inſects, was of the Claſs of the harder Bitumens, which the Heat of boiling Water would juſt bring to a proper Conſiſtence for ſpreading over the Trunks of thoſe Shrubs; and partly by entangling and ſmothering Inſects that were climbing up, and partly by driving them away by its Smell, it preſerved the Buds from being deſtroyed.

[c] The various Accounts we have of petrifying Earths and Waters, are all idle, erroneous, and imaginary, according to the ingenious and excellent Dr. *Woodward*; who affirms, that

LXXXV. There is in *Cilicia* a kind of Earth, which by boiling becomes tough and viſcous; with which they cover the Vines inſtead of Birdlime, to preſerve them from the Worms.

LXXXVI. It may alſo be proper to mention here the Earths which are naturally endued with a Quality of petrifying Subſtances immerſed in them; ſince thoſe which yield peculiar and different * Juices, have unqueſtionably ſome fixed and peculiar Properties, and

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even what has been reported ſo confidently of the petrifying Water of the Lake *Neagh* in *Ireland*, one of the moſt famous petrifying Springs on record, has been ſhewn, by a more accurate Enquiry and Trials, not to be true; but that the petrified Wood brought thence, has been all of it lodged in the Earth at the Bottom of that Lake at the Time of the Deluge. If this be the Caſe here, it is, in all Probability, in other Places too; and what gives it the better Face of Probability is, that petrified Wood is as often found in the looſe Strata of Gravel, &c. and lodged in Earth or Stone, as in the Beds of theſe Waters. Some may imagine, from having ſeen the Effects of the dropping Well at *Knareſborough*, *Ruſhbank*,

εὐφυεῖς· ἐπεὶ αἵγε, τοὺς τούτων ϖοιοῦσαι χυμοὺς διαφόρους, ἀλλήλων τιν' ἔχουσαι φύσιν· ὥσπερ καὶ αἱ τὰς τῶν φυτῶν [d].

πζ΄. Ἀλλὰ μᾶλλον ἄν τις τοὺς τοῖς χρώμασι διαριθμήσειε, οἷσπερ καὶ οἱ γραφεῖς χρῶνται.

πή. Καὶ γὰρ ἡ γένεσις τούτων, ὥσπερ ἐξ ἀρχῆς εἴπομεν, ἤτοι συῤῥοῆς τινος, ἢ διηθήσεως γενομένης.

πθ΄. Καὶ ἐνιάγε δὴ φαίνεται ϖεπυ-

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and ſeveral other Springs in *Northamptonſhire*, *Chedworth*, and *Norleach* Springs in *Glouceſterſhire*, and many other petrifying Springs, as they are called, in *England*, and elſewhere, that this is denying Things for which they have the Evidence of their Senſes: But ſuch Perſons are to be taught, that what they eſteem Petrifactions, are no other than Incruſtations of ſparry, argillaceous, and other Matter, brought away with theſe Waters in their Paſſage through the Strata, and ſettling from them again. There is great Difference between changing the Subſtance, and only covering the Surface of a Body. Theſe Petrifactions, as they are called,

are diſtinct Kinds; as are alſo thoſe which ſupply Nouriſhment to Plants [d].

LXXXVII. Nor ought thoſe to be leſs conſidered which are ſingular and remarkable in their Colours, and for that Reaſon uſed by Painters.

LXXXVIII. The Production of theſe, as was obſerved in the Beginning of this Treatiſe, is from the mere Afflux or Percolation of their conſtituent Particles.

LXXXIX. Some of theſe ſeem burnt,

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being no other than Precipitations of Matter too heavy to be longer ſuſtained in the Water; and which, being very fine, adapts itſelf to every Prominence and Cavity of the Body it ſettles upon, and exactly aſſumes its Shape. The firſt Proceſs in theſe Operations of Nature forms only an extremely thin Cruſt over the Body; on which there after ſettle at Times many more, often to a Covering of conſiderable Thickneſs in the whole, but always giving evident Proofs of the Manner in which it was ſucceſſively formed, by the Number of thin Strata of which it is compoſed.

[d] Vegetable Mould, I have before obſerved, is no genuine Foſſil.

ρωμένα, ϗ οἷον κατακεκαυμένα, οἷον ϗ ἡ[e] Σανδαράκη ϗ τὸ Ἀῤῥενικὸν, ϗ τὰ ἄλλα τὰ τοιαῦτα. ϖάντα δ', ὡς ἁπλῶς εἰπεῖν, ἀπὸ τῆς ἀναθυμιάσεως, ταῦτα τῆς ξηρᾶς ϗ καπνώδους. εὑρίσκεται δὴ ϖάντα ἐν τοῖς μετάλλοις τοῖς ἀργυρείοις τε ϗ χρυσείοις· ἔνια δὲ ϗ ἐν τοῖς χαλκωρυχείοις.

ζ΄. Οἷον [f] Ἀῤῥενικὸν, Σανδαράκη, Χρυ-

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[e] Orpiment and Sandarach have been ſpoken of in general already; they are found in different Degrees of Purity and Beauty: In ſome Places, inſtead of the fine foliaceous Flakes, or ſhining Glebes, in which they are dug in Mines, they are taken up impure, ill-coloured, and in form of a coarſe Powder; the yellow looking more like dirty Fragments of common Brimſtone; and the red like duſty Pieces of a bad Bole, than like what they really are. Theſe are, however, purchaſed by our Painters for Cheapneſs; and they ſay, with proper Management, make as good Colours as the finer Pieces; though, in their Barrels, they look more like Aſhes than the beautiful Subſtances they really are. Theſe come from ſome Part of *Germany*. And if the Orpiments and San-

and to have ſuffered Changes by means of Fire, as [e] Sandarach, Orpiment, and others of that Kind; all of them, however, plainly ſpeaking, owe their preſent Form to the Exhalation of their more humid Parts; and theſe, in particular, ſeem to have been dried, and, as it were, ſmoaked. They are found in Mines of Gold and Silver, and ſome in thoſe of Copper alſo.

XC. Of this kind are [f] Orpiment,

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darachs which happened to come in *Theophraſtus*'s way, were of this Kind, there is nothing ſtrange in his ſuppoſing them to have been acted upon by ſubterranean Fires. We know at preſent ſeven diſtinct Kinds; a plated and ſpangled yellow; a ſpangled red; a ſolid red: and a yellow, a green, and a white of theſe coarſer kinds. All the yellow are red when burnt: but thoſe here named are red naturally.

[f] The Ochre here meant is the common yellow Kind. A Confirmation that the ἀῤῥενικὸν of the Antients was Orpiment, and not a white Arſenick, as ſome have erroneouſly judged, is this Paſſage of this Author, where he ſays, It is, when powdered, of the Colour of the yellow Ochre.

The Yellow Ochre of many Parts of this

σοκόλλα, [g] Μίλτος, Ὤχρα, Κύανος, ἐλάχιϛος δὲ οὗτος, ϗ κατ᾽ ἐλάχιϛα. τῶν

Kingdom is excellent for the Uſe of Painters; and ſome of it finer than any in the World: It is found of two Kinds; the one in great Plenty, conſtituting, in many Places, whole Strata of very conſiderable Thickneſs. This is the moſt common, but is coarſe, and often mixed with arenaceous and other heterogene Matter in different Quantities. The other Kind is found in the perpendicular Fiſſures of Strata. This is not common, nor to be had in any great Plenty, but is ever of a glorious Colour, and perfectly pure, and crumbles between the Fingers into an impalpable Powder. All the Matter which compoſes it muſt have been extremely fine and ſubtle, or it never could have got into thoſe Places; into which there was no way for it, but through the Pores of the ſolid Strata. I know not whether our Painters are acquainted with this Kind, but it muſt, as *Woodward* has obſerved, be highly preferable to the common ones for their Uſe, becauſe of its Fineneſs; and it might be had in ſome Quantity on ſearching the proper Places: I remember to have ſeen much of it in different Parts about *Mendip* Hills in *Somerſetſhire*, from whence I brought the Specimens in my Poſſeſſion.

[g] Reddle, or Red Ochre, is as common and

Sandarach, Chryſocolla, [g]Reddle, Ochre, and the *Lapis Armenus*; but this laſt

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as good in *England* as the Yellow : it is, like that, generally found itſelf forming Strata, but ſometimes of a glorious Colour and extreme Fineneſs, in Fiſſures of other Matter. I have a Specimen of ſome from the Foreſt of *Dean* in *Glouceſterſhire*, very little inferior to the Sort brought from the Iſland of *Ormuz* in the *Perſian* Gulph; and ſo much valued and uſed by our Painters under the Name of *Indian* Red. It is, indeed, ſo like, both in Colour and Quality, that it is uſed for it, as the People employed in taking it up informed me; and ſent to *London* to be ſold under its Name. On comparing it with ſome of the true *Perſian* kind, which I had from the *Eaſt Indies*, I find it of a paler Colour, but of a much finer Texture; and therefore, upon the whole, perhaps not leſs valuable.

Miſunderſtandings of *Pliny*, occaſioned by Miſtakes in the Copies, have been the Occaſion of ſome very unlucky Errors about the μίλτος of the *Greeks*; which has been concluded, from what he has been ſuppoſed to have ſaid, to be Cinnabar, which they called alſo *Minium*. The Paſſage which has given Occaſion to theſe Miſtakes ſtands in moſt Copies thus, *Milton vocant Græci Minium, quidam Cinnabari*; which ſeems an abſolute Affirmation of this; but is, in

δ᾽ ἄλλων μέν εἰσι ῥάϐδοι, τὴν δ᾽ Ὤχραν ἀθρόαν ϖῶς φασιν εἶναι. Μίλτον δὲ ϖαντοδαπὴν, ὥϛε εἰς τὰ ἀνδρείκελα χρῆσθαι τȣ̀ς γραφεῖς. ϗ Ὤχρα ἀντ᾽ Ἀῤῥενικȣ̃, διὰ τὸ μηδὲν τῇ χρόᾳ διαφέρειν, δοκεῖν δέ.

ϛά. Ἀλλᾲ Μίλτȣ τε ϗ Ὤχρας ἐϛὶν ἐνιαχȣ̃ μέταλλα. ϗ κατὰ ταῦτα, καθάπερ ἐν Καππαδοκίᾳ, ϗ ὀρύττεται ϖολλή. χαλεπὸν δὲ τοῖς μετάλλοις φασὶν εἶναι τὸ

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reality, no other than a double Error; in the Words, and in the Pointing: And what *Pliny* meant to have ſaid is evidently no other than this, *Rubricam Milton Græci vocant, & Minium Cinnabari.* The *Greeks* call Reddle *Miltos*, and *Minium Cinnabar*, which is exactly the Truth. And the Paſſage, as thus reſtored by *Salmaſius*, ſtands accordingly, *Jam enim Trojanis temporibus rubrica in honore erat, qui naves ea commendat, alias circa picturas, pigmentaque rarus. Milton vocant Græci, miniumque Cin-*

is ſcarce, and found only in ſmall Quantities; whereas there are ſometimes whole Veins of the others. Ochre is ſaid to be found generally heaped together; and Reddle ſcattered, as it were, every way. Painters uſe this Reddle in their Pictures, as alſo Ochre, inſtead of Orpiment; for when powdered they ſcarce at all differ in Colour, however different they appear in the Maſs.

XCI. There are alſo in ſome Places peculiar Pits of Reddle and Ochre, as in *Cappadocia*, from whence they are taken in vaſt Quantities: But in theſe Pits, it is ſaid, the Labourers are in Dan-

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nabari. *Homer*, ſpeaking of the *Grecian* Ships, has Νῆας μιλτοπαρήους, and it is impoſſible he ſhould mean by it, that they were ſtained with the *Minium*, or Cinnabar, which was not known till after his Time, as we ſhall ſee by this Author's Account of it. Cinnabar was originally the *Indian* Name of the Gum we now call *Sanguis Draconis*; and was given to this other Subſtance (called alſo *Minium*,) from its Reſemblance to that Drug in Colour.

ϖνίγεσθαι. ταχὺ γὰρ ϗ ἐν ὀλίγῳ τȣ̃το ϖοιεῖν.

ϛβ΄. Βελτίϛη δὲ δοκεῖ μίλτος ἡ Κεία εἶναι. (γίνονται γὰρ ϖλείȣς.) ἡ μὲν ȣ̃ν ἐκ τῶν μετάλλων, ἐπειδὴ ϗ τὰ σιδήρια ἔχει [h] μίλτον.

ϛγ΄. Ἀλλὰ ϗ ἡ [i] Λημνία, ϗ ἣν καger of Suffocation; which unhappy Accident ſometimes comes on very ſuddenly.

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[h] Reddle always contains in it more or leſs of Iron; and there is one kind of it called Smitt in *England*, which is ſometimes ſo rich, as to be worth working for that Metal, and has the Name of an Iron Ore. What this Author obſerves, of its being better in the Reddle Pits than in Iron Mines, is contrary to what we find now in *England*. The Reddle I juſt before have mentioned, as ſometimes ſold in *London* under the Name of *Indian* Red, is much the fineſt I have ever ſeen; and that was not from a Reddle Pit, but from among the Iron Ore in the Foreſt of *Dean*. I have ſeen the Pits peculiarly worked for this Subſtance in *Derbyſhire* and *Staffordſhire*, and have of the Reddle from them, which is good, but much inferior to that of the Foreſt of *Dean* in all Reſpects: And, indeed, Reaſon informs us

XCII. The beſt Reddle, for there are many Kinds, is thought to be that of *Cea*, and particularly that which is taken from the Reddle Pits; for it is alſo ſometimes found in [h] Iron Mines.

XCIII. There are beſide theſe alſo, the [i] *Lemnian* Reddle, and the *Sinopic*,

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that it always naturally muſt be ſo; for it muſt, as I before obſerved, neceſſarily be finer in the Fiſſures of Strata, than where it conſtitutes Strata itſelf. And as all Reddle owes its Colour, which is its Value, to Iron, it will naturally have moſt of it, when neareſt the largeſt Quantities of that Metal: I can therefore ſee no Reaſon for that of the Pits being eſteemed the beſt by the Antients, unleſs they valued it for its Texture and Conſiſtence: Then, indeed, that muſt be preferred, as it is the moſt compact and denſe; the other being ever looſer and more crumbly.

[i] There were among the Antients two Earths of *Lemnos* well known and in common Uſe, though to different Purpoſes: Theſe Diſtinctions have been ſince loſt, and that Loſs has cauſed us a great deal of Confuſion. Theſe two

λοῦσιν Σινοπικήν· αὕτη δ' ἐστὶν ἡ Καππαδοκική. κατάγεται δ' εἰς Σινώπην. ἐν δὲ τῇ Λήμνῳ μεταλλεύεται καθ' αὐτήν.

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were diſtinguiſhed by the Names of *Terra Lemnia*, and *Rubrica Lemnia*, Γῆ Λήμνια and Μίλτος Λήμνια, the *Lemnian* Reddle, and *Lemnian* Earth: The firſt of theſe was uſed by Painters, as it was taken out of the Pit; the ſecond was firſt made into Cakes, and ſealed with great Ceremonies; and was in very high Eſteem in Medicine. I ſhall be the more particular on theſe Earths, as it will naturally lead to a better Underſtanding of ſome other of the Earths now much in uſe in Medicine; the Names of which at leaſt are ſo. The great Occaſion of the Errors about the *Lemnian* Earths, is the Miſtake of *Pliny*, in confounding them together, as he evidently has done; not diſtinguiſhing the medicinal ſealed Earth of that Place, from the Reddle uſed by Painters. The ſealed Earth was eſteemed ſacred, and the Prieſts alone were ſuffered to meddle with it. They mixed it with Goat's Blood, made the Impreſſion of a Seal upon it; and it was, therefore, called σφραγὶς, and *Sphragis* by the *Latins*; ἡ δὲ Λημνία λεγομένη γῆ ἐστὶν ἔκ τινος ὑπονόμου ἀντρώδους ἀναφερομένη καὶ μιγνυμένη αἵματι αἰγείῳ, ἣν οἱ ἐκεῖ as it is commonly called; but it is dug in *Cappadocia*, and thence carried to *Sinope*. There are particular Pits in *Lemnos*, in which nothing but the Earth is dug.

ἄνθρωποι ἀναπλάσσοντες, καὶ σφαγιζόμενοι εἰκόνι αἰγὸς, σφαγῖδα καλοῦσιν, *Dioſcorides*. This, therefore, was the Sealed Earth of *Lemnos*, the Earth uſed in Medicine, and called by the Phyſicians *Lemnian* Earth: The Hand the Prieſts had in the making it up, got it the Name of Sacred Earth, Γῆ ἱερά. And this ſeems to be the very ſame with the true *Terra Lemnia* uſed at this time; which is a fat unctuous Clay, of a pale red Colour, made up in Cakes of about half an Ounce Weight, ſometimes leſs, and brought from *Lemnos*, and many other Parts of the *Turkiſh* Dominions: This we now call *Terra Lemnia Rubra*, by way of Diſtinction from a white Earth, leſs unctuous and more aſtringent than the red, which is dug in *Lemnos* only. And we have ſometimes, beſide theſe, an unſealed Earth from the ſame Place, which is yellowiſh, with blackiſh Specks: it has this Advantage of the other, that we are ſure it is genuine; for we are ſenſible they are too often counterfeited.

Theſe were the *Terræ Lemniæ* uſed in Medicine. The *Rubrica Lemnia* was a kind of ϟδ΄. Ἔϛι δὲ αὐτῆς γένη τρία[k]. ἡ μὲν ἐρυθρὰ σφόδρα, ἡ δὲ ἔκλευκος, ἡ δὲ μέση. ταύτην αὐτάρκη καλȣ̃μεν, διὰ τὸ μὴ μίγνυσθαι. τὰς δὲ ἑτέρας μιγνύȣσι.

Reddle of a firm Conſiſtence and deep red Colour, dug in the ſame Place, but never made into any Form, or ſealed; but purchaſed in the rough Glebes by Artificers of many kinds, who had Uſes for it in Colouring. That *Pliny* confounds theſe two Subſtances is to be ſeen in this Paſſage: *Rubricæ genus in ea voluere maximè intelligi. Quidam ſecundæ auctoritatis, palmam enim Lemniæ dabant. Minio proxima hæc eſt, multum antiquis celebrata, cum inſula in qua naſcitur, nec niſi ſignata venundabatur: unde & Sphragidem appellavere:* Where it is evident, that he thought the *Lemnian* Reddle was the Subſtance ſealed and called *Sphragis*, or Sealed Earth. But that they were not the ſame, and the Earth, and not the Reddle was the Subſtance which was ſealed, is evident from *Galen*, l. i. de Antidotis, Καθάπερ ἐπὶ Λεμνίας γῆς καὶ μίλτȣ, καλεῖν δ᾽ αὐτὴν ἄμεινον ȣ̓ μίλτον, ἀλλὰ γῆν. ἐϛὶ γάρ τις Λεμνία μίλτος, ἐν τῇ Λήμνῳ, γεννομένη πρὸς ἄλλας χρείας· ἐπιτήδειος, ȣ̓ μὴν εἰς ἅς᾽ ἡ καλȣμένη Λημνία σφραγίς.

XCIV. There are three kinds of the [k] *Sinopic*; of a deep Red, another of a whitiſh Colour, and the other of a middle Colour between the other two, which is called the pure ſimple Kind, becauſe it is uſed without mixing, whereas they mix the others.

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[k] The *Sinopic* Earth, which we know at preſent, is the firſt Kind mentioned by this Author; the other two we are wholly unacquainted with, though among the Antients they were much in Eſteem with Painters. Our *Rubrica Sinopica* is a denſe, heavy, firm Subſtance, of a deep red Colour, ſtaining the Fingers in handling, and of a ſtyptic aſtringent Taſte. *Tournefort* imagines it a native *Crocus Martis*; and certain it is, that it owes its Colour, at leaſt, to that Metal.

It is dug at this Time, as it was in that of *Theophraſtus*, in *Cappadocia*, and carried to *Sinope* for Sale, from whence it has its Name, and from whence *Sinopis* became afterwards a general Name for the Red Ochres. *Μίλτος εἶδος ἐρυθρὸν Σινώπιδος*, *Heſychius*; and ſo many others. If the preſent Eſteem for this Subſtance was greater than it is, as indeed I can on Experience affirm it ought to be, it might be had, I believe, in many other Places beſide *Cappadocia*. I have ſome of it perfectly fine,

ϟέ. Γίνεται δὲ ἐκ τῆς Ὤχρας κατακαιομένης. ἄλλη χείρων· τὸ δὲ εὕρημα Κυδίȣ. συνεῖδε γὰρ ἐκεῖνος, ὥς φασι, κατακαυθέντος τινὸς ϖανδοχείȣ, τὴν Ὤχραν ἰδὼν ἡμίκαυστον ϗ ϖεφοινιγμένην.

ϟϛ΄. Τιθέασι δ᾽ εἰς τὰς καμίνȣς χύτρας κενὰς ϖεριπλάσαντες ϖηλῷ. Ὀπτῶσι. γὰρ διάπυροι γινόμεναι. Ὅσῳ δ᾽ ἂν μᾶλλον ϖυρωθῶσι, τοσȣ́τῳ μᾶλλον μελαντέραν, ϗ ἀνθρακωδεστέραν ϖοιȣ͂σι, μαρτυρεῖ δ᾽ ἂν ἡ γένεσις αὐτό. δόξειε γὰρ τὸ ὑπὸ ϖυρὸς ἅπαντα ταῦτα μεταβάλλειν·

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which was dug in the *New Jerſeys* in *America*, where it is frequently found at about 15 or 20 Feet deep, and is called, (I ſuppoſe from its Colour and ſtaining the Hands) Blood-ſtone.

XCV. There is alſo a kind of this made of Ochre, by burning, but it is not nearly ſo good as the others. The making this was an Invention of *Cydias*, who took the Hint of it, as is ſaid, from obſerving, in a Houſe which was on fire, that ſome Ochre which was there, when half burnt, aſſumed a red Colour.

XCVI. The way of making the factitious is this: They put the Ochre into new earthen Veſſels, which they cover with Clay and ſet in Furnaces; and theſe, as they grow hot, heat alſo the Ochre, and the greater Degree of Fire they give, the deeper and more ſtrongly purple the Matter becomes. The Origin of the native Kinds ſeems to teſtify that this Method is not irrational, for all theſe ſeem to have ſuffered Changes by the Action of Fire:

It was originally uſed, not only in Painting, but in Medicine; and though now neglected, and not known in the Shops, deſerves to be brought into Uſe again, being a much better εἴπερ ὁμοίαν ἢ παραπλησίαν δεῖ τὴν ἐνταῦθα τῇ φυσικῇ κομίζειν [l].

ϛζ΄. Ἔςι δ' ὥσπερ ϗ Μίλτος, ἡ μὲν αὐτόματος, ἡ δὲ τεκνική [m].

ϛή. Καὶ Κυανὸς, ὁ μὲν αὐτοφυής· ὁ δὲ σκευαςὸς, ὥσπερ ἐν Αἰγύπτῳ· γένη γὰρ

Aſtringent, as I have found by repeated Trials of that from *America*, than any of the Earths now in uſe.

[l] The making a Red Ochre from the Yellow by burning is as well known, and as much practiſed among the People who deal in Colours for Painting now, as it was in the Time of this Author. I cannot but obſerve, however, that his calling this a *Sinopis*, is a Proof of what I have before obſerved, that that Word became a Name for all the Subſtances of the Red Ochre kind. As to what this Author obſerves, of the native Red Ochres owing their Colour to Fire, it is very certain, that moſt of them ſhew no Marks of ever having been acted on by that Element. And we know very well, that the ferrugineous Particles which can make the Matter red in burning, can alſo impart that Colour to it without the Aſſiſtance of Fire.

From whence we may rationally conclude, that this way of making the factitious, is either of the ſame kind, or at leaſt very analogous to that uſed by Nature for the Production of the genuine [t].

XCVII. The Reddle alſo is of two Kinds, the native, and the factitious [u].

XCVIII. There is alſo, beſide the native *Lapis Armenus*, a factitious Kind made in *Egypt*. There are, indeed,

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Notwithſtanding which, it muſt be allowed, that there are ſome of theſe red Subſtances; and not only theſe, but ſome other Bodies, particularly ſome of the Hæmatites kind, which ſeem, even in their native Beds, to carry evident Marks of their having been wrought on and changed by Fire; though it is not eaſy to ſay, how or when it ſhould have happened.

[u] The factitious *Sinopis* juſt mentioned, was no other than a factitious Reddle, properly ſpeaking; and what the Author here mentions, was probably another Kind, made from ſome other Species of Yellow Ochre, and called Reddle, from its being of a pale red, and reſembling that of the common native Red Ochre; juſt as the other was called factitious *Sinopis*, from its being of a deeper Colour, and reſembling the genuine *Sinopis* of *Cappadocia*.

Κυανοῦ τρία· ἡ Αἰγύπτιος, ϗ Σκύθης, ϗ τρίτος ὁ Κύπριος [m]. βέλτιστος δ' ὁ Αἰγύπτιος εἰς τὰ ἄκρατα λειώματα. ὁ δὲ Σκύθης, εἰς τὰ ὑδαρέστερα. Σκευαστὸς δ' ὁ Αἰγύπτιος. ϗ οἱ γράφοντες τὰ περὶ τοὺς βασιλεῖς, ϗ τοῦτο γράφουσι, τίς πρῶτος βασιλεὺς ἐποίησε τεχνητὸν Κυανὸν, μιμησάμενος τὸν αὐτοφυῆ.

ϟθʹ. Δωρά τε πέμπεσθαι παρ' ἄλλων τε ϗ ἐκ Φοινίκης· φόρον Κυανοῦ, τοῦ μὲν ἀπύρου, τοῦ δὲ πεπυρωμένου.

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[m] I have, in another Place, obſerved the Confuſion which has ariſen from *Pliny*'s confounding the Cyanus Gem with the Cyanus Paint, or *Lapis Armenus*. We have a great Inſtance of that Error in his Tranſlation of this Paſſage of our Author; of which he has given the Senſe, but has rendered the Whole perfectly unintelligible, by ſaying all this of the Cyanus Gem, which it is moſt evident *Theophraſtus* ſays of the *Lapis Armenus*, or Cyanus Paint. There can be no queſtion but that this

three different Sorts of this; the *Egyptian*, the *Scythian*, and the *Cyprian*[m]; of which the *Egyptian* is the beſt for clear ſtrong Paintings, and the *Scythian* for the fainter. The *Egyptian* is factitious; and the Hiſtorians, who write the Annals of the Kings of that Nation, think it a thing worthy a Place in their Hiſtories, which King of *Egypt* was the Inventor of the artificial *Cæruleum* in Imitation of the native.

XCIX. Preſents are alſo made to great Perſons, in ſome Places, of this Subſtance, as well that which has paſſed the Fire as that which has not; and the *Phœnicians* pay their Tribute in it.

Author is here treating of that Subſtance, the Cyanus Paint, or *Lapis Armenus*, and not the *Lapis Lazuli*; as he has done with the Gems long ſince; and is now treating of the Earths, and particularly thoſe uſed in Painting: and his Deſcription of the Uſe of it makes this ſo notoriouſly plain, that it is aſtoniſhing *Pliny* could miſtake him: The Paſſage in *Pliny* is (ſpeaking of the Cyanus Gem) *Optima Scythica, dein Cypria, poſtremo Ægyptia. Adulteratur maximè tincturâ, idque in gloria regis Æ-*

ρ́. [mm] Φασὶ δ᾽ οἱ τὰ φάρμακα τρίϐοντες, τὸν μὲν Κυανὸν ἐξ ἑαυτȣ̃ ϖοιεῖν χρώματα τέτταρα. τὸ μὲν πρῶτον, ἐκ τῶν λεπτοτάτων λευκότατον. τὸ δὲ δεύτερον, ἐκ τῶν ϖαχυτάτων μελάντατον.

ρά. Ταῦτά τε δὴ τέχνῃ γίνεται, ϗ ἔτι τὸ ψιμύθιον [n]. τίθεται γὰρ μόλιϐ-

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gyptii aſcribitur, qui primus eam tinxit; dividitur autem & hæc in mares fæminaſque, ineſt ei aliquando & aureus pulvis, &c.

[mm] The Colours, of different Degrees of Deepneſs, which were prepared from this Subſtance, were ſeparated by means of Water: The Method of preparing them was, by beating the Matter to Powder, and putting that in a large Quantity of Water, and ſaving, in different Veſſels, that which ſubſided at different Times: the heavier Part, conſiſting of larger Particles, ſinking almoſt immediately, and the lighter, which conſiſted of much ſmaller and finer, not till after a conſiderable Time. Theſe different Quantities of Colour, that had ſubſided at the various Times, were then ſeparately ground to a proper Fineneſs, and kept as different Paints for Uſe. And this is the Meaning of the λεπτοτάτων and παχυτάτων of our Author, and *Craſſiorem tenuioremve* of *Pliny:* Which ſome, who

C. [mm] People who prepare Colours ſay alſo, that the *Lapis Armenus* of itſelf makes four different ones; the two extremes of which are, firſt, that which conſiſts only of its fineſt Particles, and is very pale; and the other, that which conſiſts of its largeſt, and is extremely deep.

CI. But theſe are the Works of Art, as is alſo Ceruſe [n], to make which, Lead

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imagined they were talking of the Degree of Colour, and not of the Fineneſs and Coarſeneſs of the Particles of the Matter, could not bring themſelves to underſtand. Indeed, in many of the Paſſages complained of as unintelligible in the Antients, the Obſcurity has been more owing to the wrong Apprehenſion of the Commentators, than the Perplexity of the Authors.

[n] We have three or four different Methods of making Ceruſe now uſed among us; but all are of the ſame Kind with this of *Theophraſtus*, and are the Effect of Vinegar on Lead. It is by ſome made by infuſing Filings of Lead in ſtrong Vinegar; which in twelve or fourteen Days will almoſt entirely diſſolve them, and leave a very good Ceruſe at the Bottom of the Veſſel. Others make it, by plunging thin Plates of the ſame Metal into Vinegar, and placing them in a gentle Heat; theſe

δος ὑπὲρ ὄξους ἐν πίθοις. ὅταν δὲ λάβῃ πάχος ἡλίκον πλῆθος, (λαμβάνει δὲ μάλιστα ἐν ἡμέραις δέκα) τότ᾽ ἀνοίγουσιν· εἶτ᾽ ἀποξύουσιν ὥσπερ εὐρῶτά τινα ἀπ᾽ αὐτοῦ, καὶ πάλιν (τιθέασι) καὶ πάλιν ἕως ἂν καταναλώσωσι. τὸ δ᾽ ἀποξυόμενον, ἐν τριπτῆρι τρίβουσι, καὶ ἐφθοῦσιν ἀεί. τὸ δὲ ἔσχατον ὑφιστάμενόν ἐστι τὸ ψιμύθιον.

ρβ΄. Παραπλησίως δὲ καὶ ὁ ἰὸς γίνεται. Χαλκὸς γὰρ ἐρυθρὸς, ὑπὲρ τρυγὸς τίθεται, καὶ ἀποξύνεται τὸ ἐπιγινόμενον. οὕτω ἐπιφαίνεται τιθέμενος [n].

Plates will be, in about ten Days or leſs, covered with a white Ruſt, which is to be ſcraped off, and the Plates plunged into the Vinegar again; and ſo ſcraped at Times till they are wholly eaten in Pieces: All the different Scrapings are afterwards ground to Powder together and kept for Uſe. Others make it, by

is placed in earthen Veſſels over ſharp Vinegar, and after it has acquired ſome Thickneſs of a kind of Ruſt, which it commonly does in about ten Days, they open the Veſſels, and ſcrape it off, as it were, in a kind of Foulneſs; they then place the Lead over the Vinegar again, repeating over and over the ſame Method of ſcraping it, till it is wholly diſſolved; what has been ſcraped off they then beat to Powder, and boil for a long Time; and what at laſt ſubſides to the Bottom of the Veſſel is the Ceruſe.

CII. In a Manner alſo, ſomething reſembling this, is Verdigriſe made; for Copper is placed over the Lees of Wine, and the Ruſt which it acquires by this means is taken off for Uſe: And it is by this means that the Ruſt which appears is produced [n].

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putting Vinegar into an earthen Veſſel, then covering it cloſely with a Plate of Lead, and ſetting it in the Sun in hot Weather: this Plate will, in about ten Days, be diſſolved and precipitated in form of Ceruſe to the Bottom of the Veſſel.

[n] Our Manner of making Verdigriſe is as

ργʹ. Γίνεται δὲ ϗ Κιννάβαρι· τὸ μὲν αὐτοφυὲς, τὸ δὲ, κατ᾽ ἐργασίαν °. αὐτοφυὲς μὲν, τὸ ϖερὶ Ἰβηρίαν, σκληρὸν σφόδρα ϗ λιθῶδες· ϗ τὸ ἐν Κόλχοις. τȣ͂το δέ φασιν εἶναι κρημνῶν. ἐνκαταβάλλȣσι τοξεύοντες. τὸ δὲ κατ᾽ ἐργασίαν ὑπὲρ

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like this of the Antients, as that of our making Ceruſe; and it is very evident, that both the one and the other have been handed down from very early Ages to us. The Manner in which we make it is this: The Preſſings of Grapes, when taken from the Preſs, are ſpread on Hurdles, and laid in the Sun to dry; after they have lain in this Manner two or three Days, and are pretty well dried, they are made into a Paſte with Wine; and left to ferment; afterwards, while in a State of Fermentation, they are rolled into Balls, and again laid in Wine till thoroughly wetted with it; and then are placed in proper Veſſels at a little Diſtance over the Wine, and ſhut up together in this Manner for near a Fortnight. After this they ſmell very ſtrong and pungent, and are in a Condition to extract the Ruſt from Copper. They are then beaten together into a Paſte, and laid, *Stratum ſuper Stratum*, with thin Plates

CIII. There are alſo two kinds of Cinnabar, the one native, the other factitious [o]; the native, which is found in *Spain*, is hard and ſtony; as is alſo that brought from *Colchis*, which they ſay is produced there in Rocks and on Precipices, from which they get it down with Darts and Arrows. The factitious

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of Copper, on wooden Bars in the ſame Veſſels; and in a Week or ten Days the Verdigriſe is formed. The Plates are then taken out, and wrapt in linen Cloths dipped in Wine, and laid for three Weeks in a Cellar. After which the Verdigriſe is ſcraped off for Uſe.

[o] The Antients, we find, had what they called the native and factitious Cinnabar as well as we: their native Cinnabar was the ſame with ours, but the factitious widely different. Theirs was no other than a Preparation of a fine ſhining arenaceous Subſtance, which was the *Sil Atticum Romanorum*, injudiciouſly confounded by *Vitruvius* with the *Ochra Attica* of the Antients; whereas ours is a Subſtance formed, by the Art of Chemiſtry, of Quickſilver and Sulphur, into a denſe heavy Maſs, of a bright red, marked with ſhining ſilvery Streaks.

The native Cinnabar of the Antients and of the Moderns are, however, the ſame; and

Εφέσου μικρὸν ἐξ ἐνὸς τόπου. μόνον δ' ἐστὶν ἄμμος, ἣν συλλέγουσι λαμπυρίζουσαν, καθάπερ ὁ κόκκος· ταύτην δὲ τρίψαντες ὅλως ἐν ἀγγείοις λιθίνοις λειοτάτην ϖλύνουσιν ἐν χαλκοῖς, μικρὸν ἐν κάλοις. τὸ δ' ὑφιστάμενον ϖάλιν λαβόντες, ϖλύνουσι καὶ τρίβουσιν. ἐν ᾧπερ ἐστὶ τὸ τῆς τέχνης. οἱ

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theirs, as well as ours, was a denſe heavy mineral Subſtance, of a ſhining red Colour; from which Quickſilver was extracted. This Subſtance was alſo called *Minium*. In After-times, becoming ſubject to Adulterations with Lead Ore calcined to a Redneſs, after the two Names had long been uſed in common, the Word *Minium* became at laſt appropriated to the calcined Lead Ore only; and the Cinnabar was uſed only to ſignify what we now underſtand by it, the Subſtance from which Quickſilver was to be extracted.

The Word Cinnabar κιννάβαρι, however, among the old Writers in Medicine, frequently is uſed to ſignify a Thing of a very different Kind, a vegetable Juice, called by us Dragonsblood; and long idly believed to be really the is from the Country a little above *Epheſus*; it is but in ſmall Quantities, and is had only from one Place. It is only a Sand, ſhining like Scarlet, which they collect, and rub to a very fine Powder, in Veſſels of Stone only; and afterwards waſh in other Veſſels of Braſs, or ſometimes of Wood: What ſubſides they go to work on again, rubbing it and waſhing it as before. And in this Work there is much Art to be uſed; for from

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Blood of Dragons. This generally was, however, called *Κιννάϐαρι Ἰνδικὸν*, from its Country, to diſtinguiſh it from the other, or mineral Cinnabar, *γίνεται δὲ ἐν αὐτῇ καὶ Κιννάϐαρι τὸ λεγόμενον, Ἰνδικὸν ἀπ᾽ τῶν δένδρων ὡς δάκρυ συναγόμενον, Dioſcorides.*

This Cinnabar they therefore knew as a perfectly diſtinct Subſtance, though called by the ſame Name. And the mineral native Cinnabar, the Thing here ſpoken of, was, we find, a hard ſtony Subſtance: Ours is a compact weighty Body, found ſometimes pure, and ſometimes incorporated with different other Subſtances, or containing other Subſtances incorporated with it.

The pure Cinnabar is generally of a bright red, ſometimes deeper, ſometimes paler, but μὲν γὰρ ἐκ του ἴσου ϖολὺ ϖεριποιοῦσιν. οἱ δὲ, ὀλίγον, ἢ οὐθέν· ἀλλὰ ϖλύσματι ἐπάνω χρῶνται, ἓν ϖρὸς ἓν ἀλείφοντες. γίνεται δὲ τὸ μὲν ὑστάμενον κάτω Κιννάβαρι· τὸ δ' ἐπάνω καὶ ϖλεῖον, ϖλύσμα.

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commonly ſparkling or gloſſy; ſome is found of a deeper and duſkier Colour in the Maſs, but becomes of a fine Red when rubbed to Powder: And ſome of it reſembles the Hæmatites of certain Kinds.

When incorporated with other Subſtances, it is chiefly found in Spar, or in arenaceous or ſparry Stones; ſometimes, but much more rarely, in clayey Earth; and ſometimes in a talky Matter, greyiſh, or bluiſh, or whitiſh.

It frequently holds incorporated with it, beſide Quickſilver, Gold, Silver, ſparry and marcaſitical Bodies, and ſometimes Lead.

It is found in *Hungary*, *Bohemia*, *Saxony*, *Spain*, *France*, *Italy*, and the *Eaſt-Indies*; but no where in greater Plenty than about *Roſenburg* in *Hungary*; where it lies chiefly in a whitiſh ſparry Stone on the Sides of the Hills;

an equal Quantity of the Sand ſome will make a large Quantity of the Powder, and others very little, or none at all. The Waſhing they uſe is very light and ſuperficial, and they wet it every time ſeparately and carefully. That which at laſt ſubſides is the Cinnabar, and that which ſwims above in much larger Quantity is only the ſuperfluous Matter of the Waſhing.

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and is gathered by the poor People, after it has been cleared and uncovered by Rains. The purer native Cinnabar has been uſed to be much eſteemed both by the Painters and in Medicine; but our factitious kind equalling it in Beauty, and being much cheaper, has baniſhed it from among the Painters. And it were to be wiſhed the Caſe were the ſame in Medicine, for the Doſe may be much better aſcertained in the factitious, than the native; which we can never be ſure of as to its exact Degree of Purity, and which may alſo contain other mineral Subſtances, which we have no Intent of giving, mixed and incorporated with it. That of *Hungary*, however, is what always ought to be kept for internal Uſe (if it be to be ſo uſed) as it is commonly more pure than that of any other Place.

ρδ΄. Καταδεῖξαι δέ φασι καὶ εὑρεῖν τὴν ἐργασίαν, Καλλίαν τινα Ἀθηναῖον ἐκ τῶν ἀργυρείων. ὃς οἰόμενος ἔχειν τὸν ἄμμον χρυσίον, διὰ τὸ λαμπυρίζειν, ἐπραγματεύετο καὶ συνέλεγεν. ἐπεὶ δὲ ἤσθετο ὅτι οὐκ ἔχει, τὸ δὲ τῆς ἄμμου κάλλος ἐθαύμαζε διὰ τὴν χρόαν, οὕτως ἐπὶ τὴν ἐργασίαν ἦλθε ταύτην. οὐ παλαιὸν δ᾽ ἐστίν· ἄλλα περὶ ἔτη μάλιστ᾽ ἐνενήκοντα εἰς ἄρχοντα Πραξίβουλον Ἀθήνησι.

ρέ. Φανερὸν δ᾽ ἐκ τούτων, ὅτι μιμεῖται τὴν φύσιν ἡ τέχνη, τὰ δὲ ἴδια ποιεῖ. καὶ τούτων τὰ μὲν χρήσεως χάριν, τὰ δὲ μόνον φαντασίας, ὥσπερ τὰς ἀλιπεῖς. ἔνια δ᾽ ἴσως ἀμφοῖν. ὥσπερ χυτὸν ἄργυρον [p].

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[p] We have now many Ways of extracting the Quickſilver from Cinnabar, but all by the Aſ-

CIV. It is ſaid, that one *Callias*, an *Athenian*, who belonged to the Silver Mines, invented and taught the making this artificial Cinnabar. He had carefully got together a great Quantity of this Sand, imagining, from its ſhining Appearance, that it contained Gold: But when he had found that it did not, and had had an Opportunity, in his Trials, of admiring the Beauty of its Colour, he invented and brought into uſe this Preparation of it. And this is no old Thing, the Invention being only of about ninety Years Date; *Praxibulus* being at this Time in the Government of *Athens*.

CV. From theſe Accounts it is manifeſt, that Art imitates Nature, and ſometimes produces very peculiar Things; ſome of which are for Uſe, others for Amuſement only, as thoſe employed in the ornamenting Edifices; and others, both for Amuſement and Uſe. Such is the Production of Quickſilver[p], which

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ſiſtance of Fire. Where the Mineral is rich, the common Way is by a kind of Deſtillation ἔστι γάρ τις χρεία καὶ τούτου. ποιεῖται δ' ὅταν τὶ (Κιννάβαρι) τριφθῇ μετ' ὄξους, ἐν ἀγγείῳ χαλκῷ, καὶ δοίδοκι χαλκῷ. Τὰ μὲν οὖν τοιαῦτα τάχ' ἄν τις λάβοι πλείω.

ρϛʹ. Τῶν δὲ μεταλλευτῶν τὰ ἐν τοῖς

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per deſcenſum, in this Manner: After beating it to Powder, it is put into narrow-neck'd earthen Veſſels, which are ſtopped with Bundles of Moſs crammed pretty hard into them: Theſe are then turned Bottom upwards, and their Necks, thus ſtopped, are let into the Mouths of other Veſſels of a like Shape, which are buried in the Ground. After the Joinings are very firmly luted, a Fire is made about the Place; and when the Veſſels grow hot, the Quickſilver gets looſe, and draining through the Moſs which ſtops the Mouth of the upper Veſſel, in which it is, falls perfectly fine and pure into the lower. This is a common Way at the richer Mines. At others, the Cinnabar is put into Retorts, and ſet in proper Furnaces; and the Quickſilver is raiſed by the Heat in Fumes, and falls into the Receiver; which is filled three Parts with cold Water, to make it condenſe again the more readily. But there is a Cinnabar which contains ſo much Sulphur, that the Quickſilver it holds can never be got looſe, without the Addition of ſomething to has its Uſes: This is obtained from native Cinnabar, rubbed with Vinegar in a braſs Mortar with a braſs Peſtle. And many other Things of this kind others, perhaps, may hit upon.

CVI. There yet remain alſo of the

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abſorb the Sulphur. This Kind is generally deſtilled by the Retort, with Quicklime, Filings of Iron, Wood-aſhes, Salt of Tartar, Potaſhes, or ſomething of that kind. And from the Reſiduum of theſe Deſtillations, a pure and genuine *Lac Sulphuris* may be prepared, by the common Way of boiling and precipitating with deſtilled Vinegar. Our factitious Cinnabar, made only by ſubliming Mercury and Sulphur together, exactly reſembles the native of ſome kinds in all its Qualities; and yields its Quickſilver pure and fluid again by the ſame Means.

But beſide all theſe Ways of procuring Quickſilver from the Cinnabars, it is ſometimes found pure, unmixed, and fluid in the Bowels of the Earth. And this Kind *Dioſcorides* diſtinguiſhes by the Name of ὑδράργυρος καθ' ἑαυτόν. This is cleared from its Earth by waſhing in common Water; and from ſome other heterogene Matters, by Salt and Vinegar, and then is ſtrained through Leather, and called Virgin Quickſilver.

It is a Mineral of a perfectly ſingular kind,

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γεωφανέσιν ἔτι λοιπά· ϖερὶ ὧν ἡ [q] γένεσις, ὥσπερ ἐλέχθη, κατ᾽ ἀρχὰς ἐκ συῤῥοῆς τινος ϗ ἐκκρίσεως γίνεται, καθαρωτέρας ϗ ὁμαλωτέρας τῶν ἄλλων.

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and when pure and unmixed, keeps conſtantly its fluid Form. It may be amalgamed with all other metallic Subſtances, but is moſt difficultly made to mix with Antimony, Iron, and Copper. It penetrates the Subſtance of all Metals, and diſſolves, and makes them brittle. It is the heavieſt of the Metals except Gold, which is to it as 4 to 3, or thereabout; and therefore will not ſwim in it, as all other Metals do. It is, however, notwithſtanding its Weight, extremely volatile, and eaſily raiſed in Form of a very ſubtle Vapour; and in that Form is diſſipated entirely by means of Fire.

Quickſilver, from its ill Effects on the Miners and People employed about large Quantities of it, was long eſteemed a Poiſon among the Antients. *Dioſcorides* reckons it a Thing which muſt have very pernicious Effects in Medicine; and *Galen* believed it highly corroſive. It firſt got into Uſe externally among the *Arabians*; and afterwards, but not till long afterwards, foſſile Kingdom certain remarkable Earths dug out of Pits, the Formation [q] of which, as was obſerved in the beginning of this Treatiſe (owing either to the mere Afflux or Percolation of their conſtituent Parts) is from a more pure and equal Matter than the other more common Kinds. And theſe re-

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was introduced into the Number of internal Medicines, from the repeated Obſervations of its Safety and good Effects when given to Cattle, and from the hardy Attempts of ſome unhappy People, who had ventured to take it down in large Quantities (in order to procure Abortion) but without any Effect.

[q] The various Operations of Nature, in the Formation of theſe and other foſſile Subſtances, have been treated of at large in the Beginning of this Work; the greateſt of all Diſtinctions among them, is that of ſuch as are found in the perpendicular Fiſſures, and ſuch as are depoſited in Strata. The Difference between theſe Kinds, in their Degree of Purity and Fineneſs, is extremely great, and muſt neceſſarily be ſo, from their different Manner of Formation; as thoſe of the perpendicular Fiſſures have been formed by Percolation, at different Times; and thoſe of Strata, by mere Subſidence from among the Waters of the general Deluge.

χρώματα δὲ ϖαντοῖα λαμϐάνουσιν ϗ διὰ τὴν τῶν ὑϖοκειμένων [r] τε ϗ διὰ τὴν τῶν ϖοιούντων διαφοράν. ἐξ ὧν τὰς μελαντῶντες, τὰς δὲ τήκοντες ϗ τρίϐοντες, συντιθέασι τὰς λίθους τὰς ἐκ τῆς Ἀσίας εἰς ταύτας ἀγομένας.

ρζʹ. Αἱ δὲ αὐτοφυεῖς, ϗ ἅμμα τῷ ϖεριττῷ τὸ χρήσιμον ἔχουσαι, σχεδὸν τρεῖς εἰσιν, ἢ τέτταρες· ἥ τε [f] Μηλιὰς, ϗ

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[r] The high-colour'd Earths uſed by Painters, and in Medicine, owe their ſeveral Colours, in a great Meaſure, to the ſame Cauſe as the Gems, *&c.* do theirs; a Mixture of metalline Matter of various Kinds, which ſtains them, as it does thoſe, with the Colour it naturally yields, in the particular kind of Solution its Particles have met with. Thus Copper, diſſolved in a proper Alkali, makes, with a proper gemmeous Matter, a blue Sapphire; and with Earth, the *Lapis Armenus,* a Subſtance before deſcribed. And the ſame Particles diſſolved in a proper Acid, give to gemmeous Matter the Colour which makes it an Emerald; and to Earth, that which makes it the *Terre verte,* an Earth uſed by our Painters, of a duſky greeniſh Colour, and denſe, unctuous,

ceive their various Colours from the Differences as well of their Properties of acting on other Bodies[r], as of their being ſubject to be acted on by them. Some of theſe they ſoften, and others melt, and afterwards reduce to Powder; and from theſe compoſe the ſtony Maſſes which we receive from *Aſia.*

CVII. But the native, which have their Uſe as well as Excellence, are only three or four; the [f] *Melian*, the

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clayey Conſtitution; generally brought from *Italy*, but to be met with entirely as good here at Home: And Iron, which gives that glorious Red to the Ruby, the Garnet, and the Amethyſt, with Earth, makes the red Boles, Ochres, and Clays.

[f] The *Melian* Earth of the Antients was a fine white Marle, of a looſe crumbling Texture, and eaſily diffuſible in Water or other Liquors. Some have imagined it to have been of other Colours; but that it was really white, we have the unqueſtionable Authority of the Antients: *Pliny* not only deſcribes it to be ſo, in his general Account of it, but afterwards confirms it in another Chapter, where he ſays it was the White of the great Painters of Antiquity: *Lib.* 35. *c.* 6. ſpeaking of it among

the other Earths, he ſays, *Melinum candidum et ipſum, eſt optimum in Melo inſula.* And *lib.* 35. *c.* 7. ſpeaking of the Painters of Antiquity, he ſays, *Quatuor coloribus ſolis, immortalia illa opera fecere, ex albis Melino, ex Silaciis Attico, ex rubris Sinopide Pontica, ex nigris Atramento.* I mention theſe two Paſſages, as the beſt Way of judging certainly from *Pliny*; for he often errs, and, where he has Occaſion to mention the ſame Subſtance a ſecond Time, frequently contradicts what he had before ſaid of it. This is to be obſerved in too many Places in that Author, and has ariſen from this; that he was a general Collector, and often careleſly put down what different Authors had ſaid of the ſame Subſtance, either under the ſame, or under different Names, in different Places of his Work: Where two ſuch Authors had been both uncertain as to the Truth, and probably the World in general alſo, they frequently made different Conjectures; and where one had erred, the other frequently corrected him. The Accounts of both, therefore, given by a third Perſon in their own Words, in different Parts of that Author's Hiſtory, and that without mentioning them as the Opinions of different Perſons, has been the Occaſion of great Part of the Contradictions in that Writer. But where he has mentioned the ſame Thing in different Places, and that with the ſame Deſcription, I always judge he may be depended on; and that the general Opinion of the World was on his Side.

With this Account of the *Melian* Earth, as white, it is very ſurpriſing that the generality of Authors, and even thoſe of the firſt Claſs, have conſtantly imagined it to be yellow. The Occaſion of the Miſtake has been, that the *Melinus Color* of the *Latins*, Μήλινον χρῶμα of the *Greeks*, is yellow. This, they took it for granted, had its Origin from the Colour of the *Melian* Earth, a Subſtance antiently uſed in Painting, and which therefore they concluded muſt be yellow, and deſcribed it accordingly. In this manner have numberleſs other Errors crept into Natural Hiſtory by Accident, and by Miſtakes, and been afterwards ſacredly propagated by a ſervile Set of Writers, who have never dared to think for themſelves, but have taken upon truſt whatever they have found in their Anceſtors Works, however contrary to Reaſon, and, in many Caſes, even to the Teſtimony of their Senſes. The Occaſion of this ſo general Error, in the preſent Caſe, is no more than the miſtaking the Etymology of the Word Μήλινος, *Melinus*, which is not derived from Μηλιὰς, or Μηλία γῆ, the *Melian* Earth here deſcribed, but from μηλις, *pomum*, an Apple; and exactly meant that kind of Yellow common on ripe Apples of many Sorts; and the ſtrict Senſe of the Verb μηλίζειν, is, according to the moſt correct Lexicographers, *Colore luteo eſſe, ſive pomum referente:* Theſe are their very Words. And hence, from an Error in a Subject foreign to the Matter, has happened, we ſee, an egregious Error in that Study, and which has been ἡ [t] Κιμωλία, ϗ ἡ Σαμία, ϗ ἡ Τυμφαϊκὴ τετάρτη παρὰ ταύτας, ἢ Γύψος.

ρή. Χρῶνται δὲ οἱ γραφεῖς τῇ Μηλιάδι μόνον, τῇ [v] Σαμίᾳ δ' οὔ, καίπερ οὔσῃ κα-

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propagated on from Author to Author, for want of conſulting even a good Lexicon.

[t] The *Cimolian* Earth had (like the other Kinds) its Name from the Place where it was originally dug, the Iſland *Cimolus*. Many Authors have ranked this among the Clays, and *Tournefort* makes it a Chalk, but it appears to me to have been neither of theſe, but properly and diſtinctly a Marle; an Earth of a middle Nature, between both: It was white, denſe, of a looſe Texture, and generally impure, having Sand or ſmall Pebbles among it, inſipid to the Taſte, but ſoft and unctuous to the Touch. Many have imagined our Fullers-earth to be the *Cimolia* of the Antients, but erroneouſly: The Subſtance which comes neareſt it of all the now known Foſſils, is the *Steatites* of the Soap Rock of *Cornwall*; which is the common Matter of a great Part of the Cliff near the *Lizard* Point. The Antients uſed their Cimolia for cleaning their Cloaths: And partly from the ſimilar Uſe of our Fullers-earth, and partly from an erroneous Opinion of that's being the ſame with the Cimolia of the Antients, it has obtained the ſame Name. We,

[t] *Cimolian*, the *Samian*, and the *Tymphaican*, called *Gypſum*.

CVIII. Of theſe the Painters uſe only the *Melian*; they meddle not with the [v] *Samian*, though it is very beauti-

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indeed, know at preſent two different Subſtances under this Denomination, with the different Epithets of *alba* and *purpuraſcens*; a much more appoſite one than the laſt of which might eaſily have been uſed. By the *Cimolia Alba*, we mean the Earth uſed for making Tobacco-pipes; and by the *Cimolia Purpuraſcens*, the common Fullers-earth, of ſuch conſtant and important Uſe in the cleaning our woollen Cloths.

[v] The *Samian* Earth is a denſe, ponderous, unctuous Clay, of a ſubaſtringent Taſte, and either white, or aſh-coloured; it is uſed principally in Medicine, and it has the ſame Virtues with the *Terra Lemnia*, and others of this Claſs. It is dug in the Iſland of *Samos*, from whence it has its Name, and never was found in any other Place that we know of. *Pliny*, indeed, ſays that it was alſo dug in the Iſland of *Melos*, but not uſed by the Painters becauſe of its Fatneſs. He errs, however, in this, which is apparently only a careleſs Tranſlation of the Paſſage before us. And it may be obſerved, from a thouſand Inſtances of this kind, how neceſſary it was to bring the genuine Work of this Author on the Subject to a more

λῇ, διὰ τὸ λίπος ἔχειν ϗ πυκνότητα ϗ λειότητα. τὸ γὰρ ἀραιὸν ἤμερον, ϗ τραχῶδες ϗ ἀλιπὲς, ἐπὶ τῆς γραφῆς ἁρμόττει μᾶλλον ὅπερ ἡ Μηλιὰς ἔχει ἐν τῷ Φάρειδι. εἰσὶ ϗ ἐν τῇ Μήλῳ, ϗ ἐν τῇ Σάμῳ διαφοραὶ τῆς γῆς πλείους.

ρθʹ. Ὀρύττοντα μὲν οὖν οὐκ ἔστιν ὀρθὸν στῆσαι [w] ἐν τοῖς ἐν Σάμῳ, ἀλλ᾽ ἀναγκαῖον

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frequent and eaſy Uſe, to avoid the being miſled by *Pliny* and others, who have miſrepreſented ſo many Things from him; and given thoſe Miſrepreſentations and Errors, as Accounts from their own Knowledge: The Paſſage in *Pliny* is, *Melinum candidum et ipſum eſt optimum in Melo inſula; in Samo naſcitur, ſed eo non utuntur Pictores propter pinguitudinem.* It is moſt evident, that this is taken from the Paſſage now before us in *Theophraſtus*; but *Pliny* deviates from his Original into a very great Error: *Theophraſtus* does not ſay, that the *Melian* Earth was dug in *Samos*, and was not uſed by the Painters; but that the *Samian* Earth, another Subſtance which he had juſt before mentioned, and was going to ſay ſomething more about, was not uſed by them; and adds, that in both theſe Places there were ful, becauſe it is fat, denſe, and unctuous; whereas ſuch as are of a looſer Texture, crumbling, dry, and without Fatneſs, are fitter for their Uſe; all which Properties the *Melian*, particularly that of *Pharis*, poſſeſſes. There are, however, beſide theſe, in *Melos* and *Samos* both, many various kinds of Earths.

CIX. The Diggers in the Pits of *Samos* cannot ſtand upright [w] at their

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many Kinds of Earth, but not that the Kind named from either, was found in the other.

[w] Our Author's Account of this Earth, and the Manner of digging it, has been generally copied by thoſe who have deſcribed it ſince. *Pliny* ſays, *accubantes effodiunt ibi inter ſaxa venas ſcrutantes*. And in another Place, *Samiæ duæ ſunt, quæ Syropicon* (or *Collyrion) et quæ Aſter appellantur*. And other of the old Authors much to the ſame Effect.

I have before obſerved, that this Earth was either white or aſh-coloured; theſe two Colours conſtituted the Difference between the two Kinds, and were what were called the *Aſter* and *Collyrion:* The white was the *Aſter*, ſuppoſed by many to be a Talc, and ſo called, for its ſhining; and the aſh-coloured was call-

ἢ ὕπτιον, ἢ ϖλάγιον. ἡ δὲ φλὲψ ἐπὶ ϖολὺ διατείνει· τὸ μὲν ὕψος ἡλίκη δίπȣς, τὸ δὲ βάθος ϖολλῷ μέιζων· ἐφ᾽ ἑκάτερα δ᾽ αὐτὴν λίθοι ϖεριέχȣσιν ἐξ ὧν ἐξαιρεῖται. διαφυὴν ἔχει διὰ μέσȣ, ϗ ἡ διαφυὴ βελτίων ἔϛι τῶν ἔξω. ϗ ϖάλιν ἑτέραν αὐτῆς καὶ ἑτέραν ἄχρι τεττάρων ἐϛὶν, ἔχȣσα. ἡ ἐσχάτη καλεῖται Ἀϛήρ.

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ed, from its Colour, *Collyrion*, Κολλύριον. Κολλύρα among the *Greeks* ſignified a kind of Loaf baked in Aſhes, and uſually brought to the Colour of the Aſhes in the doing: And from a Reſemblance to this was this Earth called *Collyrion*, or the aſh-coloured *Samian* Earth.

Pliny imagined it had the Name from its being a common Ingredient in certain Medicines for the Eyes, commonly called *Collyria*; but *Dioſcorides*, from whom he took the Occaſion of this Conjecture, does not attribute this Quality to the *Samian* Earth of either kind, but to the *Lapis Samius*, a Stone found

Work, but are forced to lie along, either on their Backs or on one Side; for the Vein of the Earth they dig runs lengthway, and is only of the Depth of about two Foot, though much more in Breadth, and is incloſed in on every Side with Stones, from between which it is taken. There is alſo in the Maſs of the Vein a diſtinct Stratum near the Middle, which is of better Earth than that without it; and within that there is ſometimes another yet finer; and even beyond that a fourth: The fartheſt of theſe is that which is called the *Aſter*.

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among it. And from this Error alone it is, that ſo many have imagined that the *Samian* Earth was uſed in Medicines for the Eyes. Indeed, when an Error in regard to the Antients is once ſet on foot, there is no knowing what a Series of different Miſtakes may be the Conſequences of it. Theſe Medicines for the Eyes, called *Collyria*, though they did not give the Name to the aſh-coloured *Samian* Earth ſo called, may ſerve, however, to confirm the Opinion of its having obtained it on occaſion of its Colour reſembling that of Aſhes; ſince they had theirs from the ſame Cauſe, and were

ρί. Χρῶνται δὲ τῇ γῇ ϖρὸς τὰ ἱμάτια, μάλιϛα Κιμωλίᾳ. Χρῶνται δὲ τῇ Τυμφαϊκῇ ϖρὸς τὰ ἱμάτια, ϗ καλȣ͂σι [w] Γύψον, οἱ ϖερὶ Τυμφαίαν ϗ τȣ̀ς τόπȣς ἐκείνȣς.

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only called *Collyria*, that is aſh-coloured Medicines, from their being made of Subſtances of the Tutty kind, and reſembling Aſhes in Colour.

[w] The Antients had many kinds of *Gypſum*, very different from one another, and uſed for different Purpoſes: but the principal were three; 1. the *Terra Tymphaica Gypſum incolis dicta*, Γῆ Τυμφαικὴ ἣν οἱ περὶ Τυμφαίαν καὶ τȣ̀ς τόπȣς ἐκείνȣς καλȣ͂σι Γύψον, the *Tymphaican* Earth, called by the Inhabitants *Gypſum*; 2. the real genuine *Gypſum*, which was made, by burning, from a certain talcy Subſtance; and 3. that made by burning many different Species of Stones of the Alabaſter and other ſimilar kinds.

The *Tymphaican* here mentioned appears to have been an Earth approaching to the Nature of the Marles, but with this remarkable Quality, that it would make a kind of Plaiſter or Cement by mixing with Water, without having paſſed the Fire. This Subſtance is yet to be found in many Places, if carefully ſought

CX. Earths of ſome kinds are alſo uſed about Cloaths, particularly the *Cimolian*. The *Tymphaican* is alſo uſed for the ſame Purpoſes; and the People of *Tymphæa* and the neighbouring Places call it [w] *Gypſum*.

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after. I remember to have taken up an Earth, which I found to have this Property, near *Goodwood*, the Seat of his Grace the Duke of *Richmond*, in *Suſſex*. And Mr. *Morton* is recorded to have ſent to Dr. *Woodward*, from *Clipſton* Stone-pit in *Northamptonſhire*, an Earth truly of this kind, and endued with this Quality, under the Name of *Calx Nativa:* His is deſcribed to be a whitiſh gritty Earth; but what I found was a true genuine Marle, ſomething looſe in Texture, but with no Sand or other ſtony Matter among it; and of this kind the *Gypſum Tymphaïcum* evidently was. This Author calls it an Earth only, and obſerves, that the People about the Places where it was found called it *Gypſum*, I ſuppoſe from its having the Properties of that Subſtance. As to its Uſe about Cloaths, the Subſtance I picked up in *Suſſex* ſeemed of a Texture ſo much reſembling that of Fullers-earth, that if it could be conveniently uſed, it might promiſe to anſwer all the Purpoſes of it, and ſo did the *Gypſum Tymphaïcum* of the Antients, of which *Pliny* ριά.' Ἡ δὲ Γύψος γίνεται ϖλείστη μὲν ἐν Κύπρῳ[x], ϗ ϖεριφανεστάτη. μικρὸν γὰρ ἀφαιροῦσι τῆς γῆς ὀρύττοντες. ἐν Φοινίκῃ

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expreſsly ſays, *Græcia pro Cimolia Tymphaïco utitur Gypſo*, lib. 36. c. 17.

This therefore, or ſomething like this, muſt be the firſt of the three principal *Gypſums* of the Antients; the other two Kinds I ſhall have Occaſion to mention hereafter; but muſt firſt obſerve, in regard to this Paſſage, that it has been ſtrangely corrupted in different Copies; inſtead of Γύψον, it is in ſeveral Ψύχον; and what I have given Κιμωλίᾳ, from the very judicious Conjecture of *De Laet*, is in moſt Copies ἢ μόνον. The Uſe of our Fullers-earth about Cloaths, and, in all Probability, that of the *Cimolia* of the Antients, was the ſame: this is not only that trifling one, of the taking out accidental Spots of Greaſe got in the Wearing, but what is the moſt important of all things in the Woollen Cloth Manufacture, the cleanſing the Pieces of it, at the time of making, from that vaſt Quantity of Greaſe, Tar, and other Filth they are fouled with, from the Tar and Greaſe uſed externally in the Diſorders of the Sheep before ſhorn, and from the Oil neceſſary to be thrown into the Cloth in the working.

[x] The *Cyprian Gypſum* here mentioned I ac-

CXI. *Gypſum* is produced in great Quantities in the Iſland of *Cyprus*[*], where it lies open, and eaſy to be diſcovered, and come at, the Workmen having but very little Earth to take

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count a different kind from the *Tymphæan*, and to be, indeed, the true genuine *Gypſum* made from the talcy Subſtance before mentioned. *Pliny* ſeems to favour this Diviſion of the *Gypſums* into three Kinds, where he ſays, *lib.* 36. *c.* 23. *Cognata Calci res Gypſum eſt; plura ejus genera. Nam e Lapide coquitur, ut in Syria ac Thuriis: & e terra foditur, ut in Cypro & Perrhibæis, e ſumma tellure & Tymphaïcum eſt.* And according to this, the three Kinds before diſtinguiſhed may be called the *Tymphæan*, *Cyprian*, and *Syrian*. The *Tymphæan* is the earthy one already deſcribed, which might, very probably, be found near the Surface, as being truly an Earth, not a Stone. The ſecond is the true genuine *Gypſum*, made from the Talc, or *Lapis Specularis*, called alſo, for that Reaſon, *Metallum Gypſinum*. And the third, the Kind made from the Alabaſters and other Stones of a ſimilar Texture.

That this *Cyprian Gypſum*, or the Kind burnt from the *Lapis Specularis*, or genuine *Metallum Gypſinum*, was the fineſt and beſt of all the Kinds, we have alſo *Pliny*'s Word, *lib.*

δὲ ϗ ἐν [y] Συρίᾳ καίοντες τοὺς λίθους ποιοῦσιν. ἔπειτα δ᾽ ἐν Θουρίοις. ϗ γὰρ ἐκεῖ γίνεται πολλή. τρίτη δ᾽ ἡ περὶ Τυμφαίαν,

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36. *c.* 24. *Omnium autem optimum ſieri compertum eſt e lapide ſpeculari ſquamamve talem habente.*

[y] The *Syrian*, or third kind of *Gypſum*, this Author here obſerves, was made by burning certain Stones, which he afterwards very well deſcribes, and which we may ſee from his Account were of the very Kind with thoſe we now principally uſe for that Purpoſe, and call *Parget*, or Plaiſter-ſtone, different Kinds of which are dug in *Derbyſhire* and *Yorkſhire* in *England*, and the Pits of *Montmartre* in *France*. There are many other Kinds in different Parts, both of *France* and *England*, very little different from theſe and from each other; but in general all of them very well anſwer the Deſcription *Theophraſtus* gives of the Stones from which what I have called the *Syrian Gypſum* of the Antients was made.

It is to be obſerved that we, as well as the Antients, burn many very different Stones into our *Gypſum*, or Plaiſter of Paris, as it is commonly called; ſome of which are of the Naaway before they get it. In *Phœnicia* and [y] *Syria* alſo they have a *Gypſum*, which they make by burning certain Stones. They have a *Gypſum* in *Thuria* too, in great Plenty; as alſo about *Tymphæa*, and in the Country of the

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ture of the foliaceous, others of the fibrous Talcs; others compoſed of Matter ſeeming the ſame with that of the Talcs, but amaſſed together in a different Form, being neither fibrous nor foliaceous, but ſeemingly in a coarſe Powder, or arenaceous Particles of uncertain Figures, and held together in the ſame manner as the Grit of the Stone of Strata: And finally, others truly and legitimately of the Alabaſter kind; in many of theſe, Particles of genuine ſparry Matter alſo diſcover themſelves; and in ſeveral, the Maſſes are wholly ſurrounded with, and in many Places their very Subſtance is penetrated by a reddiſh earthy Matter: Theſe require different Degrees of burning, according to their different Texture, to bring them to the State proper for Uſe: But in moſt of them it is done in a very little Time, and by a very ſlight Calcination, in compariſon to that required for equally altering moſt other Subſtances. The reddiſh Kinds burn to a Gypſum equally white with that made from the whiteſt. The Gypſum of *Montmartre* in *France*,

ϗ ϖερὶ Περαιϐίαν, ϗ κατ᾽ ἄλλȣς τόπȣς. ἡ δὲ φύσις αὐτῶν ἰδία. λιθοδεϛέρα γὰρ μᾶλλόν ἐϛιν ἢ γεώδης.

ριϐ΄. Ὁ δὲ λίθος ἐμφερὴς τῷ [z] Ἀλαϐαϛρίτῃ. μέγας δ᾽ ȣ̓ τέμνεται, ἀλλὰ χαλικώδης. ἡ δὲ γλισχρότης ϗ θερμότης, ὅταν βρεχθῇ, θαυμαϛή.

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the beſt and fineſt in the World, is burnt to a proper State in about two Hours. Ours of *Derbyſhire* takes but little more Time, if properly managed; and that of *Yorkſhire*, which is generally redder and coarſer, a little more than that. We have no Opportunities of trying the *Lapis Specularis* of the Antients now; but by the general Conſent of the Writers of Antiquity, the *Gypſum* made of it exceeded all the other Kinds: The Subſtance itſelf from this obtained a Name, by which it became afterwards generally known, which was *Gypſinum Metallum*. The Want of knowing this, however, among the Commentators on ſome of the Works of the Writers ſince, has occaſioned much blundering; for finding Accounts, in the moſt expreſs Words, of Windows and Reflecting Mirrors, made of the *Metallum Gypſinum*; and not conceiving that this was only

Perrhæbeans, and many other Places; but theſe are of a peculiar Kind, and are rather of a ſtony, than of an earthy Texture.

CXII. The Stone from which *Gypſum* is made, by burning, is like [z] Alabaſter; it is not dug, however, in ſuch large Maſſes, but in ſeparate Lumps. Its Viſcidity and Heat, when moiſtened, are very wonderful.

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another Name for the *Lapis Specularis*, which it had obtained from being the Matter of which *Gypſum* was made, they made no Scruple of blotting out the Word *Gypſinum*, becauſe they did not underſtand it; a Thing too cuſtomary among this ſet of People; and ſupplied its Place with *Cyprinum*, leaving a Paſſage which they imagined very dark, much darker than they found it.

[z] *Pliny* ſays, the Stones burnt to make *Gypſum* ought to be of the Marble or Alabaſter Kind; and that in *Syria* they choſe the hardeſt they can get; *lib.* 36. *c.* 24. *Qui coquitur Lapis non diſſimilis Alabaſtritæ eſſe debet aut marmoroſo; in Syria duriſſimos ad id eligunt, &c.* His Commentators ſay he took this from our Author; *hæc ex Theophraſti*, lib. Περὶ λίθων, *Dal.* If he did, he has been very careleſs in tranſlating him; a Fault I have been obliged

ριγ΄. Χρῶνται γὰρ πρός τε τὰ οἰκοδομήματα τοῦτον τὸν λίθον περιέχοντες. κᾄν τε ἄλλο βούλωνται τοιοῦτο κολλῆσαι. κόψαντες δὲ, ϗ ὕδωρ ἐπιχέοντες, ταράττουσι ξύλοις. τῇ χειρὶ γὰρ οὐ δύνανται, διὰ τὴν θερμότητα. βρέχουσι δὲ παραχρῆμα πρὸς τὴν χρείαν, ἐὰν μικρὸν πρότερον ταχὺ πήγνυται· ϗ οὐκ ἔστι διελθεῖν ἅμα.

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to obſerve in ſome other Places, that he is too apt to be guilty of. In this Paſſage, however, I am of Opinion he is not juſtly to be accuſed of it; for, with his Commentators Leave, I muſt obſerve, that it appears very plainly, from this and the Context, that he did not take it from *Theophraſtus*. This Author does not ſay, that they choſe in *Syria* the hardeſt Stones, but τοὺς ἀπλουστέρους, thoſe of the ſimpleſt Texture; and the Remainder of the Sentence in *Pliny*, which is, *coquuntque ſimo bubulo ut celerius urantur*, being evidently from ſome other Source, as there is not the leaſt Syllable of any

CXIII. They uſe this in Buildings, caſing them with it, or putting it on any particular Place they would ſtrengthen. They prepare it for Uſe, by reducing it to Powder, and then pouring Water on it, and ſtirring and mixing the Matter well together with wooden Inſtruments: For they cannot do this with the Hand becauſe of the Heat. They prepare it in this Manner immediately before the Time of uſing it; for in a very little While after moiſtening, it dries and becomes hard, and not in a Condition to be uſed.

Thing like it in this Author, 'tis probable, that he had it together from ſome other Writer, or from the common Tradition of his Time. I muſt confeſs, the Word στερεστάτους coming ſo cloſe after the μαρμάρους καὶ ἀπλουστέρους, would have made me very naturally ſuſpect *Pliny* of taking his Account careleſly from this Author; but the Context, which is evidently not hence, may very reaſonably clear him. This I have been the more particular in obſerving here, as it may be a Means of clearing that Author in ſome, at leaſt, of the many Paſſages in which he may be, even more than he deſerves, ac-

ρϛδʹ. Ἔϛι δὲ ϗ ἰσχύς. ὅτε γὰρ οἱ τοῖχοι ῥήγνυνται ϗ διαφθείρονται, ἡ δ' ἄμμος ἀνίησι. πολλάκις δὲ ϗ τὰ μὲν πέπτωκε ϗ ὑφήρηται. τὰ δ' ἄνω κρεμάμενα ϗ συνεχόμενα τῇ κολλήσει.

ρϛέ. Δύναται δὲ ϗ ὑφαιρουμένη, πάλιν ϗ πάλιν ὀπτᾶσθαι, ϗ γίνεσθαι χρησίμη. Περὶ μὲν οὖν Κύπρον ϗ Φοινίκην εἰς ταῦτα μάλιϛα. περὶ δ' Ἰταλίαν ϗ εἰς τὴν [a] κονίασιν ϗ οἱ γραφεῖς ἔνια τῶν

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cuſed of miſunderſtanding the Authors he copied from: In too many Places he has indeed but too evidently done this, though in ſome, where he is ſuſpected of it, perhaps he may not be copying from the Authors we accuſe him of miſrepreſenting, but from others, who had either accidentally, or purpoſely, deviated from

CXIV. This Cement is very ſtrong, and often remains good, even after the Walls it is laid on crack and decay, and the Sand of the Stone they are built with moulders away; for it is often ſeen, that even after ſome Part of a Wall has ſeparated itſelf from the reſt, and is fallen down, other Parts of it ſhall yet hang together, and continue firm and in their Place, by means of the Strength of this Matter which they are covered with.

CXV. This *Gypſum* may alſo be taken off from Buildings, and by burning, again and again, be made fit for Uſe. It is uſed for the caſing the Outſides of Edifices, principally in *Cyprus* and *Phœnicia*, but in *Italy*, for [a] whitening over the Walls, and other Kind of Ornaments

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what thoſe had written, and whoſe Works may be now loſt to us.

[a] What I have given εἰς τὴν κονίασιν, ſpeaking of the Uſe of the *Gypſum* in *Italy*, has ſtood in moſt Copies εἰς τὴν οἰκεῖον, which has been diſtruſted by many not to be the genuine Reading; but imagined by *Furlanus* to have been

κατὰ τὴν τέχνην. ἔτι δὲ οἱ κναφεῖς ἐμπάττοντες εἰς τὰ ἱμάτια.

ρις´. Διαφέρειν δὲ δοκεῖ καὶ πρὸς τὰ ἀπομάγματα πολὺ τῶν ἄλλων. Εἰς ὃ καὶ χρῶνται μᾶλλον, καὶ μάλισθ᾽ οἱ περὶ τὴν Ἑλλάδα, γλισχρότητι καὶ λειότητι.

ριζ´. Ἡ μὲν δύναμις ἐν τούτοις καὶ τοῖς τοιούτοις. ἡ δὲ φύσις ἔοικεν ἀμφότερά πως ἔχειν, καὶ κατὰ τὰ τῆς κονίας, καὶ κατὰ τὰ τῆς γῆς, θερμότητα καὶ γλισχρότητα. μᾶλλον δὲ ἑκατέρας ὑπερεχούσας. θερμοτέρα γὰρ τῆς κονίας, γλισχροτέρα δὲ πολὺ τῆς γῆς.

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erroneouſly put for εἰς τὸν οἶνον, and he has tranſlated the Paſſage accordingly; the κονίασιν is from the Opinion of *Salmaſius*, and ſeems to have been the very Meaning of the Author; for having been juſt before mentioning its Uſe on the Outſides of Houſes, and being going

within Houſes. Some Kinds of it are alſo uſed by Painters in their Buſineſs; and by the Fullers, about Cloaths.

CXVI. It is alſo excellent, and ſuperior to all other Things, for making Images; for which it is greatly uſed, and eſpecially in *Greece*, becauſe of its Pliableneſs and Smoothneſs.

CXVII. Theſe Qualities of the *Gypſum*, therefore, fit it for theſe and ſuch other Uſes; for it ſeems naturally to have, as it were together, the Heat, and Tenacity of Lime, and the more viſcous Earths. But it poſſeſſes both theſe Qualities in a much ſuperior Degree to either of the others, which have them ſingly; for it acquires, on being moiſtened, a Heat much greater than that of Lime, and is much more tenacious than the moſt viſcous of the Earths.

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on to recount its other various Qualities; there was nothing ſo natural for him to mention next, as its Uſe in ornamenting the inner Parts of them, the very Thing for which it is moſt famous now.

The *Gypſum* is nothing more than a Selenite,

ριή. Ὅτι δ' ἔμπυρος, κἀκεῖθεν φανερόν. ἤδε γάρ τις ναῦς ἱματηγὸς, βρεχθέντων ἱματίων, ὡς ἐμπυρώθησαν, συγκατεκαύθη ϗ αὐτή.

ριθ΄. Καίουσι δὲ ϗ ἐν Φοινίκῃ, ϗ ἐν Συρίᾳ, καμινεύοντες αὐτὴν ϗ καίοντες. καίουσι δὲ μάλιστα τοὺς μαρμάρους ϗ ἁπλουστέρους· στερεοτάτους μὲν παρατιθέντες διὰ τὸ θᾶττον καίεσθαι ϗ μᾶλλον. δοκεῖ γὰρ

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leſs elegant than the Rhomboidal or plated Kinds. Thoſe reſemble the foliaceous Talcs; and theſe the ſofter of the Alabaſters. We may always by Glaſſes diſtinguiſh the flaky Texture of the Selenite in the *Gypſum*; and thoſe unerring Teſts by Weight and Firmneſs, give convincing Proofs of the Truth. *Gypſum* is lighter as well as ſofter than Spar; but differs very little in either of theſe Qualities from the pure Selenite: To which we may add the Effect of Fire; for the fineſt Plaiſter in the

CXVIII. That its fiery Power is very great, is evident from this remarkable Inſtance: That a certain Ship which was laden with Cloaths, by ſome Accident letting in Water; the Cloaths being wetted by that Means, the *Gypſum* that was put among them took fire, and burnt both the Cloaths and the Ship.

CXIX. In *Syria* and *Phœnicia* they prepare a *Gypſum* by Fire; putting into proper Furnaces Stones, principally of the Marble, and other Kinds, which are of the moſt ſimple Texture, and heating them to a certain Degree; the harder Kinds they lay upon thoſe which burn more readily; and when burnt,

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World is made of an abſolute pure plated Selenite, found in the Fiſſures of the Strata of the common *Gypſum* at *Montmartoe*.

We have, in *England*, five diſtinct Kinds of *Gypſum*: 1. A pure white tender Kind; 2. A grey, firm, and compact one: 3. A yellowiſh; this alſo is tender: 4. A reddiſh Kind; all theſe are of a dull coarſe Aſpect; but we have a 5th, which is bright, clear, and gloſſy, and is moſt excellent of all; and, beſide theſe, *Saxony* affords a native Plaiſter Duſt, white, and

θερμότατον εἶναι πυρωθὲν, καὶ πλεῖστον χρόνον διαμένει. ὀπτήσαντες δὲ κόπτουσιν ὥσπερ τὴν κονίαν.

ρκ. Ἐκ τούτου δ' ἂν δόξειεν εἶναι φανερὸν ὅτι πυρώδης τις ἡ γένεσις αὐτὴ τὸ ὅλον ἐστίν[b].

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reſembling the others when they have paſſed the Fire.

[b] The Obſervation with which the Author concludes this Work is unqueſtionably moſt juſt. We are well acquainted with the many Changes which the Particles of Fire, inſinuating themſelves into Bodies, are able to make: Of which, their changing the Talcs and Alabaſters into *Gypſum*, and the Lime-ſtones of various Kinds

FINIS.

the Matter appears to be of extreme Strength, and fitted for enduring a long Time: After this they beat the Stones to Powder like Lime, to make them fit for Uſe.

CXX. From all this it ſeems evident, that the Properties and Nature of this Matter, are in a great Degree owing to the Fire[b].

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into Lime, are not the leaſt worthy our Obſervation, though, from their being common, and every Day before our Eyes, they are but little regarded. What the Nature of that Change is; and that the Expulſion of the fixed Air from the Stones is the great Cauſe, we have now learned with Certainty from the ingenious and excellent Dr. *Prieſtly*.

FINIS.

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APPENDIX I.

OBSERVATIONS

ON

The new-diſcovered SWEDISH ACID;

AND ON

The Stone from which it is obtained.

SECT. I.

Of the MINERAL ACID in general.

THERE exiſts in the Mineral World a native Acid; and probably only one; tho' it exhibits itſelf under different Forms.

Of the Exiſtence of this we are certain; altho' we never have ſeen it pure; nor can: It never becoming an Object of our Senſes, but in in Mixture with other Bodies. It has been called the *Vague Acid*, and the *Univerſal Acid*.

We have been accuſtomed to meet with it under two diſtinct Forms; and to know it under the Names of two Species: Theſe are the *Vitriolic* and the *Muriatic Acid:* And to theſe we are lately taught to add a third, which, from the Place where it has been diſcovered, Authors have called the *Swediſh Acid*; and to which ſome, tho' very improperly, have given the Name of the *Sparry Acid.* Perhaps, in diſtinction from the other two, it may be better named the *Stony Acid*; ſince the Subſtance from which we obtain it is a Stone; tho' not a Spar.

There are many who hold theſe Acids to be eſſentially diſtinct. Perhaps they are ſo: But it ſeems more probable, that they are only different Modifications of one and the ſame Spirit: And perhaps it will not be carrying the Opinion too far to ſuppoſe this one univerſal Acid to be the Baſis alſo, and Foundation of the nitrous; and even of the animal and vegetable Acids, the urnious, the fermented, &c.

Chymiſts of great Knowledge have proved the very near Relation between the vitriolic, and the nitrous Acid; and ſome by fair Experiments have alſo ſhewn there is a great Analogy between the nitrous and the marine or muriatic. They have endeavoured to prove, from theſe Experiments, that the nitrous, and the vitriolic on the one Part, and that the nitrous and muriatic, on the other, have ſo great

great Uniformity in many Inſtances, that they muſt be derived the one from the other: But it ſhould ſeem moſt agreeable to Nature, to refer both; as alſo the new-diſcovered Acid of Stone; to one and the ſame general Principle; of which they all three partake, altho' each has its own diſtinctive Qualities from the others; and to determine that they all originate from, or are merely different Modifications of, the ſame original Principle, the *univerſal Acid*.

This we may at all Times meet with in the three ſeparate and diſtinct Forms already mentioned, vitriolic, muriatic, and ſtony; tho' no Man ever ſaw it ſeparate and in its own. We ſee it,

1. Combined with Metal, under the Form of Vitriol.
2. With an alkaline Earth, in the Condition of Foſſile or Sea Salt.

And, 3dly, With a ſtony Subſtance, under the Form of this new-diſcovered Stone.

From all theſe Subſtances we can obtain it by Means of Diſtillation; united with more or leſs Water. And this is the only Condition in which we have, or can have any Acquaintance with it. From whichſoever of theſe Subſtances we thus produce it, there are certain general Properties in which it agrees: As alſo certain Powers or Qualities by which it differs; according to the one or other of theſe Bodies from which it is drawn.

From whichever of theſe Subſtances it is produced,

produced, it is ſour, acrid, and diſſolvent; but in different Degrees, from the various Kinds: And beſide, it is ſeparately endowed with different Characters from each.

Diſtilled from Vitriol, it is unctuous, heavy, and very corroſive: And after diſſolving calcareous Earth, forms with it a Selenite. In its concentrated State it diſſolves Silver, Tin, &c. when diluted, Copper, and Iron.

Diſtilled from Salt, it is not unctuous; is little heavier than common Water; leſs corroſive than from Vitriol; and after diſſolving calcareous Earth, forms with it, not Selenite, but a fixed Sal Armoniac. In its concentrated State it diſſolves Lead, &c.

Diſtilled from the *Swediſh* Stone, it is heavier than Acid of Salt, leſs heavy than the Vitriolic. It diſſolves the Calxes of Metals more readily than Metals themſelves. In the very Act of Diſtillation, it corrodes Glaſs; and the Stone itſelf, mixed with a calcareous Earth, becomes a peculiarly corroſive Matter, which diſſolves the beſt and ſtrongeſt Crucibles.

SECT. II.

Of the Stone from which the SWEDISH ACID is obtained.

THE Stone is of a peculiar Genus, differing both from Cryſtal and Spar; and demands a diſtinct Place and Name; as well from its natural Character, as for its artificial Products: It has been called *Fluor*, *Spatum vitreſcens*, and *Fluſs*. It is heavy, unctuous, ſoft, ſemi-tranſparent, and gloſſy: It breaks in a rudely plated Form; not rhombic.

We find it in large Maſſes; or Cluſters of ſmaller Lumps; in ſome Degree reſembling Spar, and of the like gloſſy Surface; but without the peculiar Form, or real Characters of that Stone.

A Knife will ſcratch it: It does not readily ferment with Acids, nor will it ſtrike Fire with Steel: It neither burns to Glaſs, nor Lime; but expoſed to the Action of a violent Fire, it ſplits into thin, irregular, flaky Fragments, and by Degrees crumbles into a Kind of Powder, over which the Fire has no farther Power. The Fragments do not this Way burn to Lime, nor can a calcareous Subſtance be any way extracted from them: But tho' no Fire will vitrify it alone, yet mixed with a calcareous Earth we ſee it runs freely into a Glaſs. And that it is of a peculiar Nature, and in particular ſo corroſive that it diſſolves all Veſſels, in this State; juſt as, mixed with the vitriolic Acid, it does the Glaſs of the Retort in the uſual Diſtillation. Mixed with crude Ores, it wonderfully promotes their Fuſion.

A Degree of Fire ſufficient to make the Stone red hot, deſtroys that phoſphoric Light it yields when gradually and gently warmed. Slowly heated, it is phoſphoric, as long as it continues warm: And it burns with a blue Flame without Smell. From theſe invariable Characters it is plain, that it is neither Cryſtal, Spar, Talc, or Selenite; but a diſtinct Genus of Foſſil from them all.

It is found green, yellow, white, blue, and violet coloured. The green and yellow are common in *Sweden:* There is a deep green in *Saxony:* The blue is frequent in *China*; and there is ſome in *Bohemia:* The white and the violet-coloured we have in *England.*

The foſſile Bodies that approach neareſt to its Nature, are the *Swediſh* Zeolite; the *Bolonian* Phoſphorus Stone; and our Star upon the waxen Vein.

But the Zeolite diſſolves in Acids;

The *Bolonian* Stone effervеſces readily with them, tho' it be not ſoluble; and the Star burns to Plaiſter.

No one of all which Properties belong to this new Stone.

The Zeolite is phoſphoric, juſt as it melts;

And

And the Star does not diſſolve or efferveſce with Acids: In theſe Things the two approach to the new Stone; but neither can be allowed the ſame.

The green owes its Colour, moſtly, to Iron.

I am convinced that ſome of this Stone contains that Metal; but not all; and that the Iron, where it is found, is no Eſſential Part of the Body; but a mere accidental Mixture: For I have Pieces from *Sweden*, which, tho' very green, do not become red in burning; and other green Pieces that acquire that Redneſs, which appears after burning in all Foſſils that have Iron in them.

The yellow holds a little Lead.

The blue does not owe its Colour to Copper; as is true alſo of the *Lapis Lazuli*; which is a Zeolite; and therefore allied to this Stone.

Of whatſoever Colour this Stone be, if carefully warmed, it has the electric Quality; leſs than the Tourmatine; but like it;

It has not the double Refraction of Spar; though it has much of its external Aſpect.

From theſe palpable Qualities; and certain Characters; we may advance toward an Enquiry into what it is.

The Mineral Acid, every where preſent in the Earth, (tho' never ſeen unmixed, or in its pure, ſimple ſtate) when joined with Metals, we ſee, forms the Vitriols; when united with Clay it makes the Alums; when mixed with

any

any Thing inflammable, it conſtitutes the Sulphurs; and when united with calcareous Earth, the Selenites.

Now, as this Acid can unite with Clay, and with Chalk; there is nothing contradictory to Reaſon, in ſuppoſing it may join alſo with an earthy or ſtony Subſtance, neither argillaceous or calcareous:

And as uniting with Clay it forms Alums, and with Chalk Selenites; if united with an Earth totally different in its Nature from theſe two, it will form a Body alſo different both from Alum, and from Selenite.

I am therefore led to ſuppoſe, that this Stone is a Combination of the univerſal Acid, with an Earth, differing from thoſe wherewith we have at other Times ſeen it joined.

And from

1. The unctuous Quality of the Stone;

2. Its Difficulty of Fuſion;

3. Its tenacious and gelatinous Nature in the Fire;

4. From its various Colours;

I think it moſt probable, that it is the Mineral Acid united with the Steatite; or Soap Rock.

For the Steatites has preciſely all the Colours which we ſee in this Stone; and has no others: It is unctuous like it; it ſcratches like it, in the hardeſt Pieces; it will not diſſolve in Acids; nor ſtrike Fire with Steel: And in the laſt fiery Trial it has juſt this refractory Quality; only that here it is rendered a little more tractable by the Acid.

A Stone thus formed muſt have Qualities very different from all others: And ſuch this affords on Trial.

There riſes from it in Diſtillation an Acid, different from the vitriolic, nitrous, or ſaline.

And alſo a ſolid Sublimation; of a Stone-like Nature; utterly unknown from any other Subſtance.

The Proceſs by which I tried the Subſtance was this:

Two Pounds of the green Kind of the Stone were powdered, and put into a Glaſs Retort;

Two Pounds of Oil of Vitriol were added to this;

And a Quart of Spirit of Wine was put into the Receiver.

No Heat, nor Ebullition whatſoever, followed the Mixture for ſome Time; and in the End but little.

The Veſſels were cloſed; and kept in a Reverberatory Furnace for fourteen Hours.

The Fire was ſlow at firſt; elſe the Matter would have riſen over.

No phoſphoreſcent Light was viſible at any Time.

The Fumes were at ſome Times viſible, in the Receiver; at others not. Whereas in the marine Acid they are never viſible; unleſs Air be admitted.

They were elaſtic; and had a Smell like thoſe from Spirit of Salt.

The Surface waved, and roſe a little; and there was on it an icy, and gelatinous Subſtance.

The

The upper Part of the Receiver became covered with a thin ſtony Cruſt.

The *Swedes* ſpeak of a Cruſt of abſolute Flint, upon the Surface of the Liquor in the Receiver: But they put Water there: This was the ſame Subſtance: And it remained fix'd on Part of the Receiver: While Part was diſplaced; probably by ſome light Vapour from the Spirit of Wine.

The Corroſion of the Glaſs of the Retort ſeems to be an Effect of that peculiar Sublimation which riſes in the Diſtillation; nay, and begins to riſe, even without that Operation: For watching attentively the Effect of mixing the vitriolic Acid with the Stone, I perceived, that tho' they ſeemed to meet without any Effervеſcence, yet by Degrees there appeared a ſlight Commotion; which increaſed for a conſiderable Time, and, during which, this ſtrange Sublimation of the Flores began to be made; and increaſed with it; even before any Fire was uſed.

Repeating this Trial, and breaking the Retort afterwards, no Fire at all having been uſed, I found it corroded in Waves; where the Flores had adhered to the Neck, and eaten in very deeply, juſt at the Surface of the Matter.

The Flores themſelves are extremely acrid to the Taſte, and are indiſſoluble in any Acid; nor can be run into Glaſs by any Fire.

The Acid of this Stone in its pureſt State, ſo far as I have ſeen it, is about one third heavier than Water.

After ſeven Hours a Hole was eaten thro' the Retort, and Fumes iſſued: But this was ſoon cloſed by a Cruſt formed of the Matter within; and ſo well ſtopped, that no Vapour eſcaped.

After this the Retort became corroded in a great many Places: Fumes iſſued, at them all, for a little While; but they were afterwards ſtopped by Cruſts of the ſame Kind as the former.

When the Operation was finiſhed, there were found in the upper Part of the Retort a Kind of Flowers, dry and powdery; and in the Neck a thick, ſlimy, moiſt Subſtance.

The Retort was corroded all round, juſt above the Top of the Reſiduum; and this corroded Part crumbled to Duſt between the Fingers; having loſt the Nature of Glaſs.

Here then is found a Foſſil capable of diſſolving Glaſs; a Power not known in any other Body:

Subliming an abſolute Stone during the Diſtillation; a Quality equally unknown in other Bodies:

And burning with a violet, ſcentleſs Flame: A Thing equally unknown; and the more ſtrange, as the Stone holds no Copper.

To ſhew the violet Flame, ſome of the Stone is to be broken ſmall with a Hammer; and ſprinkled on a red hot Heater, in the dark: The Flame riſes very freely, and continues ſome Time; and the Stone ſplits into thin irregular Flakes

The Uſes of the pure Acid may be infinite: And it is eaſy to ſee the Knowledge of this Subject will lead us to a thouſand unknown Truths in the Mineral Hiſtory.

The Uſes of the Stone itſelf may alſo be immenſe. We are well informed that the Steatites, and a Foſſil of the Nature of the *Bolonian* Stone, are great Ingredients in Porcelane. This Subſtance ſeems to promiſe all that can be wiſhed, without any farther Mixture. For the Matter in the Neck of the Retort, when hardened, differs little from the Subſtance of *China* Ware.

In Mineralogy there are laid open to us alſo a thouſand Articles of Wonder; which naturally perplexed us before we were acquainted with this Stone: Becauſe, not knowing this, which was the true Source of them, it was impoſſible that we ſhould gueſs how they were performed.

LEHMAN, in a very excellent Letter to Monſ. BUFFON, on the Subject of a red Ore of Lead found in *Siberia*, entertains a Conjecture, not only that this in particular, but many others, owe a great deal of their Qualities and Particularities to the Marine Acid. The Conjecture was good; but 'tis eaſy now to ſee, by numerous Inſtances, that the Acid, ſuſpected by many, and abſolutely diſcovered by this able Chymiſt, as performing many and great Things in the mineral World, is not the muriatic, but this ſtony Acid; preſent in a thouſand Places where we do not ſuſpect it; and performing a Multitude of Things which muſt have been unintelligible, and therefore wonderful to us, ſo long as we were not acquainted with it; or indeed knew of its Exiſtence.

APPENDIX II.

A N

IDEA of an ARTIFICIAL ARRANGEMENT of FOSSILS, according to unalterable Characters, and ſuperadded Qualities:

A L S O

Of a NATURAL METHOD; according to their Aſcent toward their greateſt Perfection.

FOSSILS may be arranged, according to the following *permanent* Characters, into

TWO SERIES,

1. *Simple*,
2. *Compound*,

According to the *Purity* or *Mixture* in the Body.

Each of theſe into FIVE TRIBES, by

Adding the Ideas of

1.—Vitrifiable,
2.—Inflammable,
3.—Calcinable,
4.—Incombuſtible,
5.—Soluble in Water,
6.—Metalline.

Theſe into ORDERS, by ſuperadding the Idea of

1.—Pellucid,
2.—Opake,
3.—Neutral,
4.—Alkaline,
5.—Solid,
6.—Fluid,
7.—Plated,
8.—Thready,
9.—Granulated,
10.—Uniform,
11.—Malleable,
12.—Friable.

Theſe into GENERA, by ſuperadding the Idea of

1. Form. by Trial by Acids,
and by Steel.

Theſe into SPECIES, by ſuperadding the Idea of

1. Gravity.

Theſe into VARIETIES, by ſuperadding to all this the Ideas of

1. Colour from Mixture.
1. Shape from Mixture.

And theſe into VARIETIES OF VARIETIES, by ſuperadding the Ideas of

1. Colour from double Mixture.
2. Shape from double Mixture.

And under theſe come all Individuals.

EXAMPLE.

From the moſt complete of the Tribes.

An *unorganized natural Body*, is a FOSSIL.	
Add the Idea *pure*,	
It becomes *Simple Foſſil.*	This is its SERIES.
Add to theſe *calcinable*,	
It becomes *Limey Foſſil.*	This is its TRIBE.
Add to theſe *pellucid*,	
It becomes *light Limey Foſſil.*	This is its ORDER.
Add to theſe *ſoluble in Acids*,	
It becomes *light Limey ſoluble Foſſil.*	This is its FAMILY.
Add to theſe again *tranſparent*,	
It becomes *Spar* *.	This is its GENUS.
Add to theſe a *columnar* Figure,	
It becomes *Columnar Spar.*	This is its SPECIES.
Add to theſe a *yellow* Colour,	
It becomes *Topazine Spar.*	This is a VARIETY.
Add to theſe a *blue* Colour,	
It becomes *Smaragdine Spar* †.	This is a VARIETY of a VARIETY.

After this there can be only the Difference of Bigneſs; and that diſtinguiſhes Individuals.

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* Here Foſſils begin to have diſtinct Names.

† The Blue mixt with the former Yellow producing a Green.

FOSSILS.

FOSSILS.

Series 1.—Simple.
Series 2.—Compound.

Series 1. Simple Foſſils.

Tribe 1.—Vitrifiable	*Cryſtal.*
2.—Calcinable	*Spar.*
3.—Inflammable	*Sulphur.*
4.—Incombuſtible	*Talc.*
5.—Soluble in Water	*Salt.*
6.—Metalline	*Ores.*

TRIBE I.

Simple Vitrifiable Foſſils.

Order 1.——Pellucid	*Cryſtal.*
2.——Opake.	*Earth neutral.*
Family 1.—Brittle.	
2.—Tough.	

TRIBE II.

Simple Calcinable Foſſils.

Order 1.—Pellucid.
  2.—Opake.
    Family 1.——Soluble in Acids.
      2.——Indiſſoluble.

TRIBE II. ORDER I. FAMILY I.

Simple calcinable Foſſils ſoluble in Acids.

Claſs 1.—Pellucid.	*Spars.*
2.—Opake	*Earths alkaline.*

FAMILY II.

Simple calcinable Foſſils not ſoluble in Acids.

Claſs 1.—Plated	*Selenite.*
2.—Thready	*Striated Talc.*
3.—Granulated	*Plaiſter.*

TRIBE III.

Simple inflammable Foſſils.

Order 1.—Solid	*Sulphur.*
2.—Fluid	*Naphtha.*

TRIBE IV.

Simple incombuſtible Foſſils.

Order 1.—Plated	*Talc.*
2.—Thready	*Aſbeſtos.*

TRIBE V.

Simple ſoluble Foſſils.

Order 1.—Neutral	*Rock Salt.*
2.—Alkaline	*Natrum.*

TRIBE VI.

Simple Metalline Foſſils.

Order 1.—Malleable	*Metals.*
2.—Friable	*Semi-metals.*

SERIES

SERIES II. COMPOUND Foſſils.

Tribe 1.—Earthy	*Loams.*
2.—Stony	*Stones.*
3.—Metalline	*Ores.*

TRIBE I.

Compound Earthy Foſſils.

Order 1.—Firm in Water	*Loams.*
2.—Swelling in Water	*Marles.*

TRIBE II.

Compound ſtony Foſſils.

Order 1.—Vitrifiable	*Stones.*
2.—Calcinable	*Marbles.*
3.—Saline	*Alum Ores.*

TRIBE III.

Compound Metalline Foſſils.

Order 1.—Sulphureous.
2.—Saline
3.—Arſenical.

FOSSILS.

SERIES I. TRIBE I. ORDER I.

Simple vitrifiable pellucid Foſſils.

GENUS 1.—Gems.

Generic Character.

Untouched by Acids, giving Fire with Steel; hard, bright.

SPECIES 1.—Diamond.

Specific Character.

An Octohædron of unequal Sides, impenetrable, colourleſs, pellucid.

VARIETIES

1. In Shape.

1 [*]. Columnar Diamond.

A Column of ſix Angles with two ſhort Pyramids.

2.—Squared Diamond.

A Column of four Angles, with truncated Ends.

3.—Pebble Diamond.

Without Angles, rounded or irregular.

2. In Colour.

4 [†]. Red Diamond.

Diamond coloured by Gold.

5.—Yellow Diamond.

Diamond coloured by Lead.

6.—Blue Diamond.

7.—Green Diamonds.

Diamonds, both coloured by Copper.

Variety of Variety.

8.—Purple Diamond.

Diamond coloured by Gold and Copper.

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1 [*]. Common Salt will ſhoot in Cubes, Pyramids, and Parellopipeds, but it is ſtill common *Salt*; the ſame *Species* of Body under this Variety of *Form*.

4 [†]. Colours are Additions to the *Body*, not Changes of the *Species*.

Species 2.—Sapphire.

Specific Character.

A hexangular Column of ſix unequal Sides tapering from the Baſe, and terminated by a Pyramid of the ſame Angles, colourleſs, pellucid.

Varieties.

1. In *Shape*.

1.—Pyramidal Sapphire.

An hexangular Pyramid of unequal Sides.

2.—Columnar Sapphire.

An hexangular Column of unequal Sides, with two low Pyramids.

3.—Pebble Sapphire.

Without Angles, of an oval flatted Shape.

2. In *Colour*.

4.—Red Sapphire, called Ruby.

Sapphire coloured by Gold.

5.—Yellow Sapphire, called Topaz.

Sapphire coloured by Lead.

6.—Blue Sapphire, called Sapphire.

7.—Green Sapphire, called Emerald.

Sapphires both coloured by Copper.

8.—Flamy Sapphire, called Hyacinth.

9.—Crimſon Sapphire, called Garnet.

Sapphires both coloured by Iron.

Varieties of Varieties.

10.—Firey Sapphire, called Carbuncle.

Sapphire coloured by Gold, with a little Copper.

11.—Purple Sapphire, called Amethyſt.

Sapphire coloured by Iron and Copper.

12.—Blue

12.—Blue green Sapphire, called Aqua Marine.

Sapphire, coloured by Copper and Lead.

13.—Yellow green Sapphire, called Chryſolite.

Sapphire coloured by Copper and more Lead.

14.—Coarſe green Sapphire, called Praſius.

Sapphire coloured by Copper and Manganeſe.

Theſe are the Oriental Gems.

They are all found in pebble or columnar Forms; ſingly and in Cluſters; and of different Bigneſſes.

There are alſo Cryſtals of theſe Colours, which are called occidental Gems of the ſame Names.

We know the Ingredients which give their Colour, by Experiments in colouring Glaſs and Paſtes.

Theſe with the Colour give no Addition of Weight.

There is beſide all theſe a debaſed Sapphire, fouled by Earth.

SPECIES 3.—Cryſtal.

Specific Character,

An hexangular Column of ſix equal Sides, of the ſame Tickneſs from End to End; and terminated each way by an hexangular Pyramid; colourleſs, pellucid.

VARIETIES.

1. In *Shape*.

^{a} By Accident in their Concretion.

Perfect,

1.—Cloſe Cryſtal,

A Cryſtal of 18 Planes in a ſhort Column, and two long Pyramids.

1^{b}.—Gibbous Cryſtal.

Wanting the intermediate Column,

2.—Bellyed Cryſtal,

of 12 Planes, in two hexangular Pyramids, baſe to baſe.

3.—Edgy Cryſtal,

of 16 Planes, in two octangular Pyramids, baſe to baſe.

Wanting the lower Pyramid,

4.—Spiry Cryſtal,

of 12 Planes in a hexangular Pyramid, on an hexangular Column.

5.—Broad Cryſtal,

of 10 Planes in a pentangular Column, and pentangular Pyramid.

6.—Planed Cryſtal,

of 20 Planes in decangular Columns, and decangular Pyramid.

7.—Oblique

7.—Oblique Cryſtal,
A Cryſtal of 12 Planes, with the Pyramid ſet on obliquely.

b By the Influence of Metals.

8.—Cubic Cryſtal.
Cryſtal ſhaped by Lead.
9.—Pyramidal Cryſtal.
Cryſtal ſhaped by Tin.
10.—Rhomboidal Cryſtal.
Cryſtal ſhaped by Iron.

c Unſhaped.

11.—Pebble Cryſtal.
Cryſtal without Angles in roundiſh Maſſes.

Varieties of Cryſtal.

2. In *Colour*.

12.—Yellow Cryſtal, called Occidental Topaz.
Cryſtal coloured by Lead.
13.—Blue Cryſtal, called Occidental Sapphire.
14.—Green Cryſtal, called Occidental Emerald.
Cryſtals both coloured by Copper.

Variety of Varieties.

15.—Purple Cryſtal, called Occidental Amethyſt.

3. By Impurities.

16.—Whitiſh Cryſtal.
Cryſtal debaſed by a white Earth.
17.—Brown Cryſtal.
Cryſtal debaſed by a duſky Earth.

Upon this Plan it will not not be difficult for an accuſtomed Mind to arrange the whole Foſſile World; and this may ſerve to give the intended Idea of an artificial Arrangement.

A general Inſtance of the Method of finding the Places of the ſeveral Species, may be ſeen in the Exordiums of the *Spatogeneſia.* As for Example:

Of the ORIGIN of SPAR.

The Series of Foſſils make one great Circle; for ever returning into itſelf.

There are a few primitive Bodies; Chalk, Clay, Bitumen, Talc, and the Mineral Acid.

Theſe, variouſly mixed, form many different compound Foſſils: Which mingling, in ſome Places, farther with one another, give Decompounds.

Theſe (in other Places) give up their ſeveral Primitives again to Water: Which delivers them pure in ſome other Parts; ready to form mixt and compound Bodies again.

To trace them thro' theſe Combinations, and to their natural Analyſis again, is the whole Buſineſs of the Student in this Science: For here is no Diſtinction but by Mixture: No Origin from Egg, or Seed.

A great deal of pure Clay mixed with a little Quantity of various Stones, forms the different Clays.

And a great deal of Stone with a little of the Clays, forms the various Species of Stones.

An Inſtance of this Courſe of Nature appears in the philoſophic Hiſtory of Spar.

1. The Primitives, as we have ſeen, are *Water*, *Bitumen*, *Chalk*, *Clay*, *Talc*, and *Mineral Acid:* To theſe the Operations of the Air, and Fire give great Powers of acting. We thus find

2. *Heavy Vapours*, formed of Air, and much Water. Theſe, pervading all Things,

3. Meet the Mineral Acid *, and uniting with it; if they run clear to the Surface, afford Medicinal Springs; but

4. Thus united, they may fall upon Bitumen: This is no where more frequent than in Limeſtone Rocks; and often ſtands in Puddles, in their natural Hollows †.

5. By this Mixture, uniting in its Courſe, is formed a real, tho' a fluid Sulphur: For Sulphur is nothing elſe; nor can be formed by any other Means ‡.

6. This Sulphur, not yet concreted, paſſes in its liquid Form thro' the Pores of the Lime-

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[*] The Electric Æther of the under World; preſent every where, but only ſeen concentrated, or in its Mixtures. It affects ſome Things, Bitumen moſt: And avoids others.

[†] At *Naples*; in the *Venetian* Territories; and in *Perſia*, this is very common.

[‡] Abſolute Sulphur may be made by Art with Eaſe and Certainty this Way. The Acid of Vitriol, with any Thing inflammable, affords it.

ſtone; diſſolving Part of its purer Chalk as it goes *.

7. Water thus ſaturated with the Principles of Sulphur, and with Chalk, keeps on its gradual Courſe horizontally thro' the ſame Lime Rock, till it meets a Fiſſure; a perpendicular Crack, or Opening; dividing one Part of the Rock from another. Here it ouzes forth: and meeting with a lighter Air, hangs; and evaporates ſlowly.

8. Slow Evaporation, and perfect Reſt, are the Requiſites of Cryſtalization. The Sulphur and pure Chalk thus united, form one ſolid Body; which cryſtalizing gradually, appears in regular rhomboidal Particles: and is the Subſtance we call Spar †.

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* Limeſtone is only coloured, hardened Chalk; and Marble is the ſame. Marble is a purer Limeſtone, and Limeſtone a coarſer Marble.

† Spar ſuppoſed to be one Thing, is therefore a mixed Body, and ſo are the pureſt Salts. We can make a Subſtance of the Nature of Spar, by cryſtalizing the Lixivium of Lime and Sulphur.

NATIVE FOSSILS.

CLASS III.

SPAR.

SPATUM.

A pure Foſſil; compoſed of Brittle Rhombs.

SPAR is known from Talc by its Want of Elaſticity;
——from Selenite by its Want of Flexibility;
——from Cryſtal by its Dullneſs, and by fermenting with Acids.

It is heavier than any of the three other pellucid Foſſils; and is known from all Bodies in the World (when pure enough to be ſeen through) by its doubling Lines laid under; and viewed through it.

This laſt Property has been ſuppoſed peculiar to that Species of Spar called Iſland Cryſtal: And the greateſt Writers, *Linnæus*, *Wallerius*, *Cronſtedt*, and the long *et cætera*, have ſeparated that Body from the pure Rhombic Spar; which they ſuppoſed not to have the double Refraction. But this Power reſides in all Spar I have examined: And is of its Nature: As it ariſes from the internal Conſtruction of the Body, which is made up of ſmaller Rhombs, applied one to another.

The very Atoms of Spar are Rhombic; and thoſe ſmalleſt Pieces into which it may be ſeparated by gentle Acids, without Solution, applied to the Microſcope over a Line proportionably fine, have the ſame Power.

No Body has this Conſtruction except Spar; therefore no other natural or artificial Subſtance has this Power of double Refraction. Even Sir *Iſaac Newton* has ſaid, Cryſtal has ſomething of this Power; in vain: For no Authority can ſtand againſt the Teſtimony of the Senſes. All different Mediums vary in Refraction; but this peculiar Power reſides only in a pellucid Body formed of connected Rhombs.

The State of Refraction in the pellucid natural Bodies is this,

1. Talc in thick Maſſes elevates the Line.
2. Selenite waves it.
3. Cryſtal diſtorts it.
4. Spar gives it double.

All Spar does this, even that which takes the Form of Cryſtal, in Pyramids, and Columns: Therefore even the variouſly angulated

Forms of Spar are compoſed of Rhombs; and the Conſtruction of Spar, and of Cryſtal, are perfectly different, even while their Forms are the ſame.

Spar is ſeldom found original, and free: A few pure Rhombs; and two Columns, double pointed, which were dug in the Hartz Foreſt; are all I have of it.

Nature has mixed its Particles among the Matter of the Marbles and Limeſtones; from whence it is waſhed forth by the pervading Water, and left ſlowly by it, in their Cracks and Fiſſures; where it aſſumes theſe various Forms:

1. Pure Rhombs of a larger Size.
2. Rude Maſſes, formed of coarſe connected Rhombs.
3. Plates compoſed of connected Rhombs.
4. Columnar, Pyramidial, and Cubic Figures, fixed upon the Surface of theſe rude Maſſes *.

In this latter Caſe the rude Maſs continues uncoloured, and is the Root; and the columnar or pyramidal Figures riſe from it frequently yellow, often of other Colours: Theſe cut into a Kind of Gems, but ſtill have the double

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* The Stone from which the *Swediſh* Acid before deſcribed is obtained, has been added to theſe; but erroneouſly. It is a diſtinct Body.

Refraction equally with that Part we call the Root.

5. Icicles and Dropſtones.

That the Spar formed in Fiſſures of Rocks, is thus waſhed out of the Limeſtone itſelf is certain:

Becauſe none but Limeſtone Rocks have Spar in their Fiſſures; Rocks of Cryſtaline Matter, or formed of vitrifiable Stone, have Cryſtal; never Spar in their Cracks.

Linnæus wonders at the Nature of that Force which ſplit the Rocks into theſe Cracks: But probably the Cauſe is very familiar; they were formed moiſt, and cracked in drying.

Spar grows continually; for whereſoever there is a Crack in a Limeſtone Rock, new, or old; Spar always fills it; and over-runs the Surface.

Letters cut hollow in a living Rock of Limeſtone, fill up, in a Courſe of Years, with Spar; and what were made in Creux are found in Relief. This has been ſeen in *Gothland* by the eminent *Swede*; and in the Grotto of *Antiparos* by *Tournefort*. The very Time may be determined by the Dates, which are often a Part of the Inſcription; but it is always long. The Spar ſtands higher as the Time is more diſtant: and has been ſeen in ſome Places a Quarter of an Inch above the Level of the Surface.

If there could want a Proof of the continual Growth of Spar, the Stalactites would ſhew it; and the Incruſtations, in what are called our petrifying Springs; but that is a fouler Sort: There is in *Norway* a Pyramid of Spar two Inches long, which was once mine; in which two Branches of the ſolid Heath Moſs, or Lichen, are perfectly embodied.

It has been thought the Spar in Cracks of Rocks was brought from elſewhere by Water; or was and is originally in all Water: The latter is the Opinion of *Linnæus*; *Henkell* maintains the former. But if either were the Caſe, Spar would be ſometimes found in vitreſcent Rocks, and Cryſtal in thoſe of Limeſtone; which Obſervation denies.

Spar they ſay will be formed where Water can be retained; but indeed alſo where it cannot; 'tis enough that it ouzes ſlowly: Nay, not Water alone diſſolves Spar; but it can be retained in Vapour. I have from *Cornwall* Incruſtations of true Stalactite, formed in the Pipes of Fire Engines in the Mines, at Heighths to which the Water never aſcends, by many Feet; but only Vapour.

Mundick is alſo thus a Creature of the Air, in many Places. I have trigonal Pyramids of Spar, which hung from the Top of the *Bauman*'s Cave, in the *Hartz*, covered with Cubic Mundick; there is none in the Spar itſelf; and from the particular Circumſtances of the Specimen, Water could not have lodged upon it, only Vapour.

Spar is one Thing, of one Weight, one Hardneſs, and when pure can never be miſtaken for any other Foſſil. It is liable to have other

other Bodies mixt with it; and to be altered in its Condition by that Mixture: But 'tis itſelf the ſame. *Wallerius* diſtinguiſhes three Degrees of Hardneſs in this Foſſil; but they are owing to thoſe Mixtures; the leaſt hard is the true Condition of Spar; the other Degrees ariſe from Iron, or other Additions.

It is the Opinion of *Linnæus*, that Spar owes its angulated Form to Sea Salt; and the Cryſtals to other Salts: But there is no Warrant in Nature for this Judgment. Salts are acrid, and diſſolve in Water. Theſe Foſſils have neither of thoſe Qualities: And who ſhall tell us that the Property of forming itſelf into regularly angulated Figures is peculiar to Salts? We have no Authority to believe it is wanting in Cryſtal, and Spar; and we have the Evidence of our Senſes that they have it.

The ingenious and ingenuous *Cronſtedt* well obſerves, theſe Figures ought not to be aſcribed to Salts, till the Preſence of ſuch Salts can be proved in them.

The calcarious Nature of Spar is of its Eſſence; and no Form, nor all the other Characters in the World, could conſtitute a Thing a Spar that wanted this. They all ferment with Acids, and they burn to Lime: Nor is this latter Quality equivocal, as ſome would think, becauſe by the Fire of a great Burning Glaſs, Spar vitrifies. This is not the Fire, when we ſpeak of Lime; and it can be a Teſt of nothing becauſe all Things vitrify before it:

That is the extreme Force of Fire: And the ultimate Effect of Fire on all Bodies is Vitrification.

Linnæus ſays, the Spar he calls *Natro-ſpatoſum*, ſcarce does effervefce with Acids: And it may be added, that the Particles of that Spar are ſcarcely at all rhombic: Spar and Cryſtal are mixt in thoſe Bodies; and they have mixt Qualities; but ſtill as there is ſome Spar, there is ſome Effervefcence.

'Tis vain to give the Forms of Spar to Natrum; for we not only find no Natrum there, but different Spars have Forms of different Salts; and the great Patron of the Salt Syſtem allows, that ſome of them affect the various angulated Figures of Alum, Sea-Salt, Vitriol, and the reſt. 'Tis true, they reſemble thoſe Forms; but they have not thoſe Forms exactly: Nor is either of theſe, or any other Salt whatever, to be found exiſting in any of them.

But whither will not the Wind of Theory blow even the ſteadieſt Judgments? The foremoſt of the Writers, who favour this Syſtem, becauſe there are in Spars certain Forms that do not agree with thoſe of any known Salt, fancies for the Formation of theſe that there exiſt Salts, not otherwiſe known to us, but by this Operation. When Theory can reach this Heighth, it may do what it pleaſes: To create Cauſes, becauſe we ſee Effects that ſeem to us to require them, is to make all Things eaſy; and at the cheapeſt Rate.

If

If we can ever bring Spar, after Solution, to recryſtallize, as Salt; we ſhall ſee all Things explained in this Particular. 'Tis what I have tried four Years, with poor Succeſs; and I have now requeſted the ableſt Chymiſt that we have, to join with me in the Attempt. What may ariſe under his experienced Hand, I know not: All I have found is, that the ſwifter the Fluid is evaporated, the coarſer is the Matter left behind; and the more Length of Time is given, the nearer it approaches to a Promiſe of Cryſtals.

I think when this ſhall be accompliſhed, we ſhall find all Spar to be but one Thing; differing only according to the other Matters mixed with it. 'Tis ſaid, the Selenite powdered and mixt in Water affords Cryſtals; and *Kahler* gives the Authority of an eminent Metallurgiſt for it: With me neither has this ſucceeded yet: But I have no Deſpair; and tho' it never ſhould ſucceed with me, it may with others: When that is ſeen, the other, more important as it is, need not be ſuppoſed impoſſible.

Nothing is more familiar than the Production of what it is the Cuſtom to call, Selenitical Salts; Urine affords them; and ſome Preparations of Sulphur; but to recryſtalize Selenite is, to produce, from a clear Fluid, pellucid dodecahacedral Rhombs, flexile, not elaſtic, and not ſoluble again in Water: And he who ſhall effect this, need not deſpair of recryſtalizing alſo Spar.

The Salts in Urine that has ſtood long come nearer the Nature of Foſſils than any Thing we know; and Tartar, formed from Wine, is very difficult of Solution: Yet both theſe may be melted in pure Water. The Salt produced by ſlow Cryſtalization from a Lixivium of Lime and Sulphur, comes neareſt of all to Spar; but ſtill it is but an Approach; and not a Sameneſs: As he who is well acquainted with all the Qualities of the vitriolated Tartar will perceive: Nor do I conceive *Henkel*'s Receipt, formed on the ſame Foundation, would go any farther: But till Men ſpeak plain, 'tis vain to war againſt their buried Meaning.

In fine, the Formation of Spar is yet a Subject of Enquiry: Its Atoms are all Spar; each Particle into which we can without Violence divide it, is the ſame in all Reſpects as the Whole: And as the Foſſil World admits no Generation, or Birth, by Egg, or Seed, it ſeems moſt probable that all the Variety of Forms in which we ſee this Protean Mineral, are owing to no Cauſe beſide the Arrangement of Rhombs into as many Forms as they are capable of producing. It fills the Cracks of its own Rocks: And of no other: For Cryſtal. Columns riſe from cryſtaline Rocks; and from metallic Maſſes, fractur'd, grow Pyritæ; each ſeparated from the great mixt Body we ſee ſplit; and each formed into Figures by its own Laws, without the Intervention of Salt, or other Matter.

We

We find hollow Cryſtals, and we have hollow Pyramids of Spar; but 'tis a raſh Thought, tho' of a great Man, to imagine that a Cryſtal of Salt was firſt formed in theſe Caſes; and when the ſtony Coat was finiſhed over, it melted away again: This is Imagination: But there is not a hollow Stalactite that may not ſhew the Senſes, and convince the Reaſon, that this Shell of Spar, or Cryſtal, may be formed without a ſolid Nucleus.

There are no entire Rocks of Spar; and they who thought they had ſeen ſuch of Cryſtal, perhaps miſtook pure Ice for them. Both Spar and Cryſtal riſe in general from foul Stones; and they who thought Ice grew to them in Time, were ſcarce more pardonable than ſuch as took Ice for them. *Scheukzer* has ſeen the Difficulty of accounting for their Forms, and joined the Lamentation of Philoſophers upon that Subject; for the Salt Syſtem was not then in being: But the old *Pliny* has not only lamented this Difficulty, but aſſigned its Cauſe; and this a Cauſe to overthrow that Syſtem utterly: It is, that tho' the Figures be all regular, they are not all alike; or all reſolvable into the ſame Laws.

'Tis an invidious Office, and unpleaſing, to dwell upon the Errors of thoſe who wrote before; but theſe are ſo received, and ſo eſtabliſhed, that there is no other Way to Truth.

Wallerius ſays, that Spar is compoſed of rhombic and pyramidal Particles: And thereſore breaks into both theſe Forms. It is unwillingly I diſſent in a few Particulars, from an Author with whom Reaſon and Obſervation command me to agree in a great many: But this is a Doctrine which ſtrikes at the Root of all accurate Knowledge in reſpect of this Body.

By this Account Spar would be two Things, not one: Its Atoms would have two Figures; and we ſhould loſe the great Diſtinction by which it is kept ſeparate from all other Bodies. I have examined this Point with all poſſible Attention; and find the pyramidal Figures of Spar, whether in greater or ſmaller Pieces, to be a ſecondary Form; compoſed always of Rhombs: But the rhombic Figure never to have any Form in its conſtituent Parts beſide its own. The Pyramids, great or ſmall, ſeparate into Rhombs; the Rhombs never into Pyramids. The true Way of dividing Spar is, by an Acid, carefully managed; for the Parts are always ſeparated, before they are diſſolved.

It is a ſingular and a juſt Obſervation of the ſame Author, that no pentagonal Spar has ever been found; tho' Angles in moſt other Numbers are frequent; but this is not to be attributed with him, to an imaginary Salt, Alcaline, and Muriatic; it reſts upon a much more ſolid Baſe: Which is, that the particular Figure of the Rhombs of Spar, admit the conſtructing any other angulated Form, only not pentagonal.

It

It has been ſaid, that Iſland Cryſtal ſhines in the Dark after it has been calcined in Manner of the *Bolonian* Stone; but this is not particular to that Species: It is the Quality of all Spar as Spar; only there requires great Nicety in the Calcination: Perhaps Selenite alſo has this Power. *Linnæus* refers the *Bolonian* Stone to Spars: To me it has appeared rather a Selenite; and of all Bodies in Nature, moſt of Kin to that Species of Selenite we call the Star, upon the waxen Vein. I have therefore retained it in that Place, till more of this ſcarce Foſſil comes in my Way for Trial: If it proves Spar, 'tis eaſily removed into that Claſs; and thus, and only thus, we can arrive at Truth; after a thouſand Errors.

That the Hog Spar affords Flowers on Sublimation, has been urged as a great Proof of its containing Salts of ſome Kind or other; known or unknown: But ſurely this Property is more naturally reſolved into another Source. All Bitumens yield Flowers on Sublimation; and we have the Teſtimony of our Senſes to the Preſence of a Bitumen in the *Lapis Suillus*: It ſtinks of it. Nay more, there is a Smell of Sulphur in all Spar, when calcined: *Henkel* and *Wallerius*, as well as I, have found it; and if we could give way to any Thought of ſecondary Forms in a Foſſil whoſe Conſtruction appears perfectly homogene, and ſimple, my Senſe of it would be, not to ſeek them in imaginary Salts, but real Sulphur.

We ſee the Way Art imitates it beſt, is by the Cryſtals of a Liquor in which Lime and Sulphur have been boiled. Sulphur is thus diſcloſed on the calcining of Spar; and for the other Ingredient, Lime, we cannot be at a Loſs; ſince it has been obſerved, no Spar is ever produced in Cracks of any Rocks, except thoſe of Limeſtone: Nay, and what may ſtrengthen this Opinion, the Lime of Spar is weaker than that of Limeſtone, which a little Sulphur may cauſe. All this, is but Conjecture; and is delivered as ſuch, and no other; but yet it reſts on the Teſtimonies of the Senſes; not on the Flights of the Imagination: And it is by Conjecture, in theſe dark and difficult Reſearches, we muſt arrive at Truth.

I claim no better Authority for many of the particular Obſervations here, than for this general one; they are indeed all founded on Examination, and Experiments, now made on the Occaſion; but they are Examinations and Experiments made only on the Bodies in my own ſcanty Store: I invite, I ſollicit, and intreat with my beſt Earneſtneſs, others to repeat them on their own. If they anſwer as in mine, the Doctrines are eſtabliſhed; if they differ, there is no one in the World to whom that Truth will be more welcome than to myſelf. To equivocate about an Error, is pitiful: to attempt to juſtify it, is diſingenuous: No Man ſhould be aſhamed of ſetting right his own Miſtakes (eſpecially in

Matters where Miſtakes are unavoidable) whether by his own or others Obſervation. With how many hundred Errors did the *Species Plantarum* make its firſt Appearance; how many of them have been rectified; and how many yet remain to be ſet right? Yet no one ever blamed *Linnæus* for his firſt Conjectures; nor has the World ſeen any other Book of Science of equal Value.

Such Errors are the Children of imperfect Information; and muſt be found in all who attempt to write for general Utility.

Let others therefore freely repeat theſe my Experiments, and add more of their own; and with an honeſt Freedom tell the Reſult of all. My ſingle Attention can only make a few Experiments, where true Knowledge demands a thouſand: But the Reſult of different Trials will bring forth Truth.

It never was more needed in Philoſophy than in the Part before us; for with all the Plauſibility of Syſtem, we cannot but perceive, upon this free and fair Enquiry, that the Student in Foſſils has yet to work upon a Chaos: And that the Paths into a better Light, are ſtopped and cloſed up utterly: Not by Ignorance; but what is much worſe, by authenticated Error; authenticated even by greateſt Names. We muſt unwind this Charm, if ever we hope to gain the right Clue to lead us thro' the Labyrinth of Nature: We muſt break the fated Taliſman; and all the ſeemingly impregnable

Structures will vaniſh: The Ground will be clear before us; and if we loſe ourſelves in the open Way, 'tis eaſy to be ſet right again.

Spar formed by Nature, as above related, may either concrete in its pure State as ſoon as made; or it may paſs, while yet fluid, thro' various Strata of earthy, ſaline, Mineral, and other Matter, and receive great Changes both in Form and Colour from them: It may appear to us therefore, according to theſe Circumſtances, either

in its own pure State of a colourleſs Rhomb;
or foul'd by Earths; or tinged by Metals;
or plated, by an Admixture of Talc;
or rendered cubic by the Natrane Marle; and thoſe Cubes ſtained to a Mimickry of Gems by Metals;
or it may be ſhaped into Polygons by an aluminous Earth;
or thrown into Pyramids, with or without Columns, by the Salts of Mineral Waters:

Or from the mere Nature of its Concretion, it may appear as Curtains ſpread upon a Wall;
as Icicles hanging from a Roof;
or Globules drop'd upon the Floor;
or as a Coat upon Moſſes, or Shells, or various other Matters.

According to theſe Accidents it may be thrown into a Kind of Method, under the Terms Genus and Species, to great Advantage.

The obvious Characters giving an artificial Method; and the Conſideration of their Origin a natural one.

Nor is it more difficult, with due Care and Attention, to follow the ſeveral other Foſſils thro' their gradual Approaches to Perfection, in their various Kinds; and by marking the Degrees and Steps of this Aſcent, to lay down a ſure Foundation of the moſt deſirable of all Attainments in this Study, a natural Method: Dividing them into Genera, Species, Varieties; and a yet ſubordinate Diſtinction to all, Varieties of Varieties. For Inſtance;

Genus. Species. Variety.

Marles,
In their Aſcent to Ochre, aſſume the following Names and Characters:

1. White Marle—*Melinum* of the Antients.
This takes in *Chalk*, and becomes,
The Cimolia of the Antients.
Bole, and becomes,
The Collyrium Samium of the Antients.
Clay, and becomes,
The Marga Fungosai.
Spar, and becomes,
Lac Lunæ.
Talc, and becomes,
The Aster Samius of the Antients.

2. Brown Marle—*Fullers Earth.*
This takes in *blue Clay*, and becomes,
The Blue Marle of *Staffordſhire.*
brown Clay, and becomes,
The Brown Marle of *Suſſex.*
Sand, which is Cryſtal, and becomes,
The Terra Saponaria of *Kentman.*

3. Red Marle—*Reddle.*
This takes in *Fullers Earth*, and becomes,
The Marga Saxatilis Incarnata of *Worm.*
Bole, and becomes,
The Rubrica Fabrilis of *Kentman.*
Clay, and becomes,
The Red Stony Marle of *Yorkſhire.*

4. *Black Marle.*
This takes in *decayed Animals and Vegetables*, and becomes,
Garden Mould.

This is ſhown by their Decompoſition; and proved by their ſpecific Gravities.

Variety of Variety.
This *Cimolia*, taking in *Bole*, becomes,
The TERRA MELITENSIS of the Shops.

This *Fungoſa* takes in *Chalk*, and becomes,
The TERRA CHIA [*] of the Shops.
This *Lac Lunæ* takes in *Chalk*, and becomes,
The GYPSUM TYMPHAICUM of the Antients.

This *blue Marle* takes in *Morochthus*, and becomes,
The MARGA COLUMBINA of *Pliny*.
This *brown Marle* takes in *Chalk*, and becomes,
The MARBLED MARLE [†] of *Yorkſhire*.
yellow Clay and *Sand*, and becomes,
The YELLOW MARLE of *Suſſex*.
Clay and *Selenites*, and becomes,
The STONY MARLE of *Staffordſhire*.
This *Saponaria* takes in *White Tripela*, and becomes,
The TERRA NOCERIANA of the Shops.
This *Rubrica Fabrilis* takes in *Clay*, and becomes,
The HEAVY RED MARLE of *Kent*.
Red Bole, and becomes,
The ALMAGRA [‡] of *Spain*.

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[*] This *Chia* takes in white *Bole*, and becomes,
The PIPE EARTH of the *Iſle of Wight* [*].
[†] This *marbled Marle* takes in *Sea Shells*, and becomes,
The SHELLY MARLE of *Suſſex*.
[‡] This *Almagra* takes in *yellow Sand*, and becomes,
The SIL SYRICUM of the Antients.

[*] A moſt amazing Mixture; but proved by the irrefragable Teſtimony of ſeparated Parts and their ſpecific Weight.

Genus. Species. Variety.

Ochres,

In their *Aſcent* to *Tripelas*, aſſume the following Names and Characters.

1. White Ochre—The *Terra Melia* of the Antients.

2. Yellow Ochre—The *Ochra Attica* of the Antients.
This takes in *Bole*, and becomes,
The HARD OCHRE of the Painters.
This takes in *Iron*, and becomes,
The PENSYLVANIAN OCHRE *.

3. Red Ochre—The *Sil Atticum* of the Antients.
This takes in *Spar*, and becomes,
The FLORIDA OCHRE.
Clay, and becomes,
The RED VIRGINIAN OCHRE.

4. Purple Ochre—The *Terra Sinopica* of the Antients.
This takes in *Cryſtal*, and becomes,
The SIL MARMOROSUM of the Antients.
Iron, and becomes,
The OCHRE OF DEAN.

5. Brown Ochre—*Umber*.
This takes in *putrified Wood*, and becomes,
COLOGN EARTH.

6.—Green Ochre—The *Lapis Armenus* of the Antients.
This takes in *white Sand*, and becomes,
The GREEN OCHRE of *Germany*.]

7. Black Ochre.

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* There is alſo a pure yellow Ochre of Chalybeate Springs, which is the *Earth of Iron*.

Variety of Variety.

This *hard Ochre* takes in *Clay*, and becomes,
The HEAVY OCHRE of *Yorkſhire.*
This takes in *Lead*, and becomes,
The GIALLOLINO OF NAPLES.

This *Sil Atticum* takes in *Chalk* and *Bole*, and becomes,
The BENGAL EARTH.

This *Terra Sinopica* takes in *White Bole* and *Clay*, and becomes,
The VENETIAN RED BOLE *.

This *Green Ochre* of *Germany* takes in *Copper*, and becomes,
GREEN MINE OCHRE.

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* This *Venetian Red* takes in *Iron*, and becomes,
The PERSIAN EARTH of *Ormuz.*

Genus Species. Variety.

Tripelas,

In their Aſcent to *Boles*, aſſume the following Names and Characters.

1. White Tripela—The *Creta Argentaria* of the Antients.

This takes in *Ochre*, and becomes,

The COMMON TRIPELA, or Gleba Alanar.

blue Clay, and becomes,

The TERRA MELIA of *Dioſcorides*.

Spar, and becomes,

HARD CHALK.

2. Brown Tripela—called *Rotten Stone*.

This takes in *Spar*, and becomes,

The FRENCH ROTTEN STONE.

Talc, and becomes,

The WILTSHIRE ROTTEN STONE,

3. *Red Tripela*.

This takes in *Talc*, and becomes,

LAMINATED TRIPELA.

Boles,

Theſe ſeveral Varieties are not found to admit of any other Mixture,

Genus. Species. Variety.

Boles,

In their Aſcent to *Clays*, aſſume the following Names and Characters.

1. White Bole—The *White Bole Armenic* of the Shops.
   This takes in *Chalk*, and becomes,
   The FRANKFORT EARTH of the Shops.
   Marle, and becomes,
   The TERRA LIGNICENSIS of the Shops.
   Clay, and becomes,
   The TERRA MELITENSIS of the Shops.
   Spar, and becomes,
   The WHITE TUSCAN EARTH.
   Cryſtal, and becomes,
   The TERRA LEMNIA ALBA of the Shops.

2. Yellow Bole—The *Yellow Lemnian Earth* of the Shops.
   This takes in *Marle*, and becomes,
   The TERRA LIGNICENSIS LUTEA of the Shops.
   Clay, and becomes,
   The BOLUS TOCCAVIENSIS of the Shops.
   Spar, and becomes,
   The BOLE ARMENIC OF GALEN.
   Iron, and becomes,
   The TERRA LIVONICA LUTEA of the Shops.
   Copper, and becomes,
   The GREEN BOLE of *England*.

3. Brown Bole—The *Sileſian Bole*, or *Axungia Solis*.
   This takes in *Marle*, and becomes,
   The PALE GERMAN BOLE.
   Clay, and becomes,
   The GOSSELAER BOLE.

4. Orange Bole—The *Bolus Bohemica* of *Kentman*.

5. Red Bole—*Red Bole Armenic*.
   This takes in *Marle*, and becomes,
   The CAROLINA BOLE.
   Tripela, and becomes,
   The TERRA PORTUGALICA of the Shops.
   Clay, and becomes,
   The TERRA SIGILLATA RUBRA MAGNI DUCIS.

Variety of Variety.

This *Frankfort Earth* takes in *White Clay*, and becomes,
BENGAL BOLE.

This *Malta Earth* takes in *Natron*, and becomes,
The TERRA ERETRIA of the Antients.

This *Goſſelaer Bole*, takes in *Pnigitis*, and becomes,
SPOTTED BOLE. 16.

This *Bole Armenic* takes in *Bitumen* and *Natron*, and becomes,
The TERRA LEMNIA RUBRA.

This *Carolina Bole* taking in *Spar*, becomes,
The BOLE OF BLOIS.

This *Portugal Earth* taking in *Marle*, becomes,
The TERRA TURCICA of the Shops.

This *Tuſcan Earth* taking in *Marle*, becomes,
The TERRA LIVONICA of the Shops.

Spar and *Clay*, becomes,
The EARTH OF STRIGA.

Genus. Species. Variety.

Clays,
As they advance in Purity, aſſume the following Names and Characters.

1. White Clay—*Tobacco Pipe Clay* of *Pole*.
This takes in *blue Clay*, and becomes,
The Pipe Clay of *Northampton*.
Spar, and becomes,
The Paretonium of the Antients.

2. Yellow Clay—*Brewers Clay*.
This takes in *Chalk*, and becomes,
The Yellow Pot Earth of *Staffordſhire*.
Cryſtal, and becomes,
Hedgerly Loam.
White Sand, and becomes,
Northamptonshire Pot Earth.
Pale yellow Sand, and becomes,
Common Loam, or Brick Earth.

3. *Brecon* Clay—from *Chedder* Rocks.
This takes in a fine *black Marle*, and becomes,
The Marbled Earth of Lemnos.
Selenites, and becomes,
Fine Tile Clay.
Yellow Sand, and becomes,
Founders Clay.

4. Blue Clay—in the Cracks of Strata.
This takes in *Marle*, and becomes,
The Coarse Pot Earth of *Leiceſterſhire*.
Bole, and becomes,
One of the China Earths.
Yellow Sand, and becomes,
Shropshire Pot Earth.
Talc, and becomes,
The Northampton Clay.

5. Green Clay—from Ochre Pits.
This takes in *Marle*, and becomes,
The Mendip Clay,
Selenites, and becomes,
The Dorset Clay.

6. Red Clay.—*Mahogany Earth* of the *Iſle of Wight*.
This takes in *Spar*, and becomes,
The Fine red Staffordshire Earth,
Cryſtal, and becomes,
The Pale Staffordshire Earth.

7. Black Clay—The *Pnigites* of *Galen*,
This takes in *White Clay*, and becomes,
The Sussex Pipe Clay.

Variety of Variety.

This *Northampton Pipe Clay* takes in *yellow Sand*, and becomes,
COMMMON POT EARTH.
White Sand, and becomes,
The HARSH CLAY OF STAFFORDSHIRE
Brown Sand, and becomes,
The FINE STAFFORDSHIRE EARTH.
Large pale yellow Sand, and becomes,
FINE GREY BRICK EARTH.
This *Paretonium* takes in *White Sand*, and becomes,
GOLT.
Yellow Sand, and becomes,
LEICESTERSHIRE POT EARTH.
This *yellow Stafford Earth* takes in *Cryſtal Sand*, and becomes,
POOR EARTH OF STAFFORDSHIRE.
Talc, and becomes,
SHROPSHIRE BRICK EARTH.
With *yellow* and *white Sand* and *Talc*,
DORSET BRICK EARTH.
This *Tile Clay* taking in *white Clay*, becomes,
The HARD STAFFORDSHIRE EARTH.
Spar, becomes,
The OXFORDSHIRE FLOOR CLAY.
This *Founders Clay* takes in a *large white Sand*, and becomes,
The RED BRICK CLAY.
Garden Mould, and becomes,
TILLAGE LAND.
This *Shropſhire Pot Earth* takes in *Spar*, and becomes,
GALLYPOT EARTH.
Selenites, and becomes,
BLUE BRICK EARTH.

This *Mendip Clay* takes in *Spar*, and becomes,
The GREEN HAMPSHIRE EARTH.

This *Staffordſhire Red* takes in *Spar*, and becomes,
The PURPLE STAFFORDSHIRE EARTH.
Brown Clay, and becomes,
COARSE BRICK EARTH.
Iron, and becomes,
The RED LAND of *Rowell*.
This *Suſſex Pipe Clay* takes in *Selenites*, and becomes,
The LIGHT MENDIP CLAY.

And in this Manner may the whole Foſſil World be arranged, upon the certain Principles of Decompoſition, and the ſpecific Gravities of the ſeveral ſeparate Parts: It will be a Work of Time; but the Plan is here.

FINIS.

GREEK

TWO
LETTERS:

ONE,

On the Colours of the SAPPHIRE
and TURQUOISE.

AND THE OTHER,

On the Effects of different Menſtruums
on COPPER.

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LETTER I.

On the Colours of the SAPPHIRE and TURQUOISE.

SIR,

WHEN my Notes on THEOPHRASTUS were mentioned Yeſterday, ſome objected to the *Sapphire*'s being coloured by Particles of *Copper*, and ſeemed very firm in the Opinion, that that Gem owes its Dye to a *Native Zaffer*.

I am ſorry I have only Room to name Things in thoſe Notes, without Opportunities of entering into a Detail of the Experiments. Thro' the Courſe of thoſe Notes I have not tied myſelf down to the Sentiments of any particular Author, but have, as my own Experiments and Obſervations directed, at Times agreed to, and in other Places diſſented from, the Opinions of the whole Number. And how I have ſucceeded in this Example, the faireſt Way of judging will be firſt, fairly to give the Arguments uſed in Support of the other Opinion; which are principally three, and have the Appearance of being of ſome Weight. They are:

1. That the *Turquoiſe* is evidently coloured by the ſame Matter with the *Sapphire*, and that the Matter of its Colour is known to be a *Native Zaffer*.
2. That *Copper* is not capable of giving the deep Blue of ſome of the deeper *Sapphires*; and of the *Veins* and *Striæ* of the rough native *Turquoiſes*.
3. That *Zaffer* is the Subſtance which colours the common blue Glaſs; and that it is capable of giving it the Colour of the deepeſt native *Sapphires*; as is evident from the counterfeit ones which are coloured with it, and are of all the Degrees of Colour of the genuine.

To which permit me to anſwer,

Firſt, That it was incumbent on the Aſſertors of this Doctrine, to have proved the Exiſtence of this *Native Zaffer*, before they attributed ſuch great Effects to it. I am not aſhamed to ſay, that I don't know what *Native Zaffer* is; that I never yet ſaw any ſuch Foſſil, nor believe I ever ſhall: And, notwithſtanding that Dr. *Woodward*, and ſome other able Naturaliſts have ventured to name ſome of their unknown Specimens native *Zaffers*, I cannot bring myſelf to think that Nature ever formed any Subſtance that could be properly ſo called; all that I have been ſhewn as ſuch, having been Things which a little Chemiſtry was able to ſhew that Naturaliſts ought to have been aſhamed of calling by ſuch a Name: Not that I would pretend to limit the Operations of Nature within the Bounds of our narrow Underſtandings; or declare any Thing impoſſible, becauſe it has not yet been ſeen to be effected: But I think the Aſſertors of ſuch great Effects from ſo very uncertain a Subſtance, ought, if ever they had ſeen it, to have given a more rational Account of it than any we have at preſent.

The *Zaffer* we know, and with which the blue Glaſs and counterfeit *Sapphires* are ſtained, is a Preparation which ſeems to owe its preſent Mode of Exiſtence to the extreme Force of Fire; and is perhaps no genuine Production of Nature, even in a latent State, except in its conſtituent Principles. It is prepared from *Cobalt*, affording, by the Aſſiſtance of Fire, the Arſenics, this Subſtance; and *Smalt*, with the Addition of a fixed Alkali. After the Fire of a reverberatory Furnace has driven off the arſenical Particles, the remaining Maſs is powdered and calcined three or four Times over; and then being mixed with three Times its Quantity of powdered Flints, affords us the common *Zaffer*.

But it may be proper to examine what Weight, even allowing the Exiſtence of a *native*

tive Zaffer, there is in the Arguments founded on its ſuppoſed Effects.

And to the *Firſt*, That the *Turquoiſe* and *Sapphire* are coloured by the ſame Matter, and that this Matter is univerſally allowed to be a *native Zaffer:* I ſhall anſwer, That I allow the *Sapphire* and *Turquoiſe* to be coloured by Particles of the ſame Kind; that I know it to be the common Opinion, that the *Turquoiſe* is coloured by *Zaffer*, and not by *Copper:* But that I alſo know it to be an erroneous one. I know the *Turquoiſe* owes its Colour to *Copper* only; having ſucceeded in a Courſe of Experiments, by which I have been able to diveſt the *Turquoiſe* wholly of its Colour; to precipitate and preſerve that Colour ſeparate and alone; to prove that Colour, by the Effects of different Menſtruums, to be abſolute Copper; and, by Experiments founded on this Proceſs, to give, by a Solution of Copper in a volatile Alkali, the true *Turquoiſe* Colour to the Subſtance of the *native Turquoiſes*, which is abſolutely no other than animal Bone; and to make, by that means, thoſe factitious *Turquoiſes*, which have been put, before a judicious Aſſembly, to the ſevereſt Trials; and gave all the Marks of the genuine.

To the *Second* Argument, That *Copper* is not capable of giving ſo deep a Blue as that of ſome of theſe Gems; I have a Solution of *Copper*, the very one with which I ſtained the factitious *Turquoiſes*, which is of the true Colour of the deepeſt Male *Sapphires*, and deeper than the commonly called *black Veins* of the rough native *Turquoiſes*, if carefully examined.

The Authors of this Objection might, indeed, have known, from the excellent Mr. *Boyle*'s Experiments, that *Copper* is the laſt Thing to be, with any ſhew of Reaſon, ſuſpected of wanting this Property; for that Gentleman has proved, that a Grain of that Metal is capable of giving a blue Colour to 530,620 Times its Bulk of Water.

In regard to the *Third* Argument, That the genuine *Sapphires* are probably coloured by *Zaffer*, becauſe blue Glaſs, and the counterfeit *Sapphires* are ſo; I cannot but obſerve, that external Appearances are of little Weight in Philoſophy; and I am ſorry to ſay, that it was only a very ſuperficial View of theſe Things, that could ſtart an Objection to *Copper*'s colouring the *Sapphire*, from them: For a more careful Examination of theſe very Bodies, muſt afford Arguments for the contrary, as it will evidently prove, that the Colour of the *Sapphire* cannot be owing to the ſame Subſtance with that of theſe Glaſſes: Since the very Heat neceſſary for forming them, would, in a few Minutes, wholly diveſt the fineſt *Sapphire* in the World of all its Colour.

The common blue Glaſs is made from the common or cryſtal *Frit* melted with *Zaffer*; and the fineſt counterfeit *Sapphires*, with a cryſtal *Glaſs*, worked with an Admixture of *Lead*, and this *Zaffer*, in the Proportion of

about

about one fiftieth Part. The *Lead* gives, in this Caſe, an additional Denſity to the Glaſs, which adds greatly to the Luſtre of the counterfeit Gem; as the more denſe the tranſparent Matter is, the more bright and vivid the metalline Tinge appears through it; but while *Lead* thus increaſes the Denſity, it debaſes the Glaſs in another reſpect of equal Conſequence, in that it makes it ſofter. Whichever of theſe Subſtances, however, is made the Subject of this Experiment, the Effect will be the ſame; for if we bring to the Trial of only a clear Charcoal Fire, a genuine *Sapphire*, and either of theſe factitious Subſtances, and throw them together into it, we ſhall ſoon ſee that they owe their Colours to Particles of a very different Kind; for the Genuine will be ſeen to emit a fine clear blue Flame, the Counterfeit not ſo much as the leaſt Vapour; and when, after this, they are taken out together, the true *Sapphire* ſhall be found wholly colourleſs and tranſparent as a Piece of Cryſtal, and the Counterfeit or Glaſs, unaltered.

Fire, which is thus able to diveſt the *Sapphire* of its Colour, has alſo the ſame Effect on the *Turquoiſe*; as the Workers on it well know: And this is eaſily accounted for, if they are coloured, as I am convinced they are, by a fine metalline *Sulphur*. But I will venture to affirm, that it could not be the Caſe, if thoſe Gems were coloured by a *Zaffer*.

Let it not be here objected, that the Workers on the native *Turquoiſes* are obliged to have Recourſe

Recourſe to Fire to give them their Colour; and that therefore it is not probable, the ſame Power ſhould be able to take it away; for the Truth of this, is only, that the Colour of the native *Turquoiſes* of ſome Countries is not equally ſpread through the whole Maſs, but lodged in different Parts of it in Form of *Veins* and *Striæ:* It is to diſlodge the Colour from theſe *Veins*, and diffuſe it equally thro' the whole Maſs, that they have Recourſe to Heat: A very gentle Fire is all they dare truſt on this Occaſion, and is always found ſufficient. What I would obſerve from the Whole of this is, that this Effect of Fire on the rough *Turquoiſes*, is a Proof that their Colour is owing to the ſame Particles with that of the *Sapphire*; and that this diſlodging and diffuſing it through the whole Maſs, is the firſt Step toward the diſſipating and entirely driving it off; for a little too long Continuance in the ſame Heat, will, as the Workmen too often find to their Sorrow, wholly drive off the Blue, and leave the Matter colourleſs, as the *Sapphire* when taken from the Fire.

I am,

SIR,

Your humble Servant,

JOHN HILL.

LETTER II.

On the Effects of different Menſtruums on COPPER.

SIR,

IN a Letter of the 19th of laſt Month, which you did me the Honour to read before the ROYAL SOCIETY, I endeavoured, principally by means of ſome Experiments I had been lately making, to ſettle the Queſtion ſo much diſputed among the preſent Naturaliſts, Of, what the blue Gems in general are coloured from. What engaged me in the Diſpute, was an Objection raiſed againſt the Opinion I had declared myſelf of in this Caſe, in my Notes on *Theophraſtus:* And I am very happy to find, that even the Gentlemen who made that Objection are now convinced, that it is to *Copper* alone that the *Sapphire* and *Turquoiſe* owe their beautiful Blue.

For myſelf, I muſt acknowledge, that tho' I have long been convinced of the Fact, the Manner in which it was effected, was long a great Difficulty to me: The Menſtruum in which my Tincture of *Copper*, (which proved to

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to the Senſes, that *Copper* was capable of giving the deepeſt and fineſt Blue imaginable) was made, was a volatile alkaline Spirit: And where Nature could find, in the Bowels of the Earth, any Thing analogous to a volatile urinous Alkali, produced by Chemiſtry, was a Queſtion not eaſily anſwered. The particular Salt of the mineral Waters ſeems to approach, indeed, ſomething to a Menſtruum of this Kind; and Dr. *Hoffman* has proved, that it is at leaſt much fitter to be claſſed with the Alkalies than with the Acids. But the Syſtem of the Colours of the blue Gems being from *Copper*, muſt ſtand upon a very precarious Baſis, if there could be found no other Menſtruum than one we are ſo very uncertain about, to ſtrike their Colour from that Metal.

Copper, however, is, in Truth, perhaps the fartheſt of all the Metals from being ſubject only to the Power of one appropriated Menſtruum; and a Courſe of Experiments on it, have now ſhewn me, that we need not have Recourſe to ſo uncertain a mineral Subſtance as this latent Alkali, for producing a Blue from it; but that Menſtruums of another Kind, even Acids, and thoſe the very Acids, whoſe Principles are the commoneſt of all others in the Earth, can afford us the ſame Colour; and are every where to be found in great Abundance. Gold is ſoluble only in *Aqua regia*; for all the other Menſtruums that are talked of for it, have a genuine Sea-ſalt for their Baſis, and are therefore only ſo many

Kinds

Kinds of *Aqua regia*; Silver, in *Aqua fortis*, but not in *Aqua regia, or Spirit of Salt, or Oil of Vitriol*, or, in ſhort, in any but the nitrous Acids: whence it may very properly be ſaid, that Sea-ſalt is the true Diſſolvent of Gold, and Nitre of Silver. Lead is readily diſſolved by the weaker Acids, but not at all by *Aqua regia*, and but difficultly by many of the ſtronger; Iron by moſt of the acid Salts; and Tin by *Aqua regia*, and not eaſily by any other Menſtruum, unleſs firſt diveſted of its Sulphur by Calcination; but *Copper* is to be diſſolved by every Kind of Salt; and, in ſhort, by almoſt every thing that ever had in Chemiſtry the Name of a Menſtruum; and produces, with its different Solvents, an almoſt infinite Variety of very beautiful Colours: So that it may indeed have been the Baſis of the Colour of, perhaps, more of the Gems than has yet been imagined.

Filings of *Copper* dropt into the Flame of a Lamp, thrown into an horizontal Direction by a Blow-pipe, emit a very beautiful green Flame.

Mixed with three Times their Quantity of corroſive Sublimate, and afterwards diveſted of the Mercury by Fire, they form, with the remaining Salts, a tranſparent Reſin of a beautiful *Hyacinth* Colour, which will melt and burn in the Fire, emitting alſo a fine green Flame.

Expoſed to the Fumes of Quickſilver, they become white and ſhining like Silver.

Melted

Melted with *Zink*, they make an uniform Maſs of a fine gold Colour, as they do Braſs with Calamine.

Held over melted Orpiment, they become not only white but brittle.

And by extreme Violence of Fire, are converted into a hard, denſe, glaſſy Matter, of a deep Red; tranſparent, and in ſome Degree reſembling the *Sorane Garnet*.

It has been the general Opinion of the Chemiſts, that Solutions of this Metal in Acids were green, and in Alkalies blue: Some, however have altered, from a few Experiments of their own, or perhaps only from what they imagined muſt have been the Succeſs of Experiments, this general Account; and particularly among certain of the more modern Writers, it has ſtood, that *Copper*, diſſolved in Acids or fixed Alkalies, affords a green Colour; and in volatile Alkalies, a fine Blue: But you will obſerve, by the following Experiments, that theſe Accounts are neither of them to be depended on: And, indeed, whoever has Diſquiſitions of this Kind to attempt, will always find, that it muſt be a Knowledge of Nature, and not of Books, that will afford him what he can depend on; and that Syſtems built on any Body's Experiments but his own, will be found to ſtand on a very infirm Baſis.

What I have been able to learn, by repeated Experiments on this Metal in Menſtrums of all Kinds, is, that the Solutions of it in different Fluids, cannot be, in regard to Colour, determinately

determinately reduced into Method at all: The different Acids having the Properties talked of in the Alkalies, of producing different Colours; and even the ſame Acid being ſometimes capable of affording either a green or a blue Solution, according to the different Quantity of the Metal diſſolved in it. In Caſes of this Kind, however, I have every where judged the moſt perfect Solution the propereſt to deſcribe the Effect of the Menſtruum by: And of what I have principally learnt by theſe Experiments, be pleaſed to accept the following Account.

A Solution of *Copper* in Oil of Olives, is of a fine graſs Green; in white Wax, of a bluiſh Green, approaching to the Colour of our *Aqua marine*; and in pure Water, of a dead whitiſh Green. In regard to theſe Menſtruums it is, however, to be obſerved, that the expreſſed vegetable Oils do not diſſolve *Copper*, as Oils, but by means of certain other heterogene Particles which they contain; for all expreſſed vegetable Oils contain in them Water, and a latent acid Salt: of both which, I am pretty certain, they may be wholly diveſted by Fire, and rendered, by that Means, incapable of acting as Menſtruums on this Metal: For I have found, that Oil of Olives, after long boiling, has been capable of extracting ſcarce any Colour at all from *Copper*; and make no doubt but that it might be ſo perfectly deprived of its Acid, as well as Water, by long boiling with Litharge, or ſome ſimilar Subſtance proper to imbibe its Acid, as to have no Power of diſſolving this Metal at all. Nor is this latent Acid peculiar to the expreſſed Oils alone; thoſe procured by Diſtillation evidently contain it alſo, as the excellent Dr. *Hoffman* has proved, who by grinding the diſtilled Oils of Lavender and Turpentine with Salt of Tartar, obtained thence a neutral Salt.

Wax, in like Manner, diſſolves *Copper* no otherwiſe than by a true, genuine, and pretty ſharp Acid, which it evidently contains, and which is eaſily ſeparated from it by Diſtillation with a very gentle Heat. And in regard to Water, it may not be improper to obſerve, that though it is but a poor Diſſolvent of Metals with us, yet it may in the Bowels of the Earth, do Wonders: For we find evidently, that the Power of Water, as a Menſtruum, depends, in many Caſes, exactly on its Degree of Heat; and as it is capable of the greater Heat, the greater Weight of the Atmoſphere it is preſſed by, we know not to what Height its Heat and diſſolving Power may be raiſed at great Depths in the Earth.

Of the mineral acid Menſtruums, Spirit of Sea-ſalt, Spirit of Nitre, and *Aqua regia*, all afford green Solutions of *Copper*, but with this Difference, that the Spirit of Salt gives a yellowiſh Green; the Spirit of Nitre a deep Green, with no Yellowneſs at all; and the *Aqua regia*, a bright vivid Green, but there is ſome Admixture of Yellow in it, about in the ſame Meaſure that it is in ſome of the Gems which *Pliny*

Pliny deſcribes by, *Quorum extremus igniculus in flavedinem exeat*. The Solution in Spirit of Nitre is of the true Emerald Colour, and extremely bright and vivid; and each of the others reſembles very exactly the Colour of a particular Gem of the ſame Claſs; the firſt of them being perfectly of the Colour of the yellowiſh green *Praſius*, and the third of the *Smaragdo-praſius*.

Theſe Colours are each of them very beautiful; and that of the Solution in *Aqua regia* is no other than what muſt be expected, when we know the Colours of the other two, the Spirits of Salt and Nitre being ſimple Menſtruums, and affording a green, and a yellowiſh green Solution; and the *Aqua regia*, a compound Menſtruum, partaking of the Nature of both the others, it muſt naturally give a Solution of a Colour between both, that is a Green with leſs Yellow than that of the Spirit of Salt.

But though theſe three acid Menſtruums afford green Solutions of this Metal, it is too haſty a Concluſion to infer from thence, that all the Acid Menſtruums will therefore do the ſame; for Solutions of Copper in Oil of Vitriol, Oil of Sulphur, and *Aqua fortis*, are all blue. They are in different Degrees, tho' all nearly approaching to each other; and the deepeſt of them not darker than that of the common *Turquoiſes*. Theſe Solutions have alſo this peculiar Property, that they immediately precipitate their Copper on Iron, if immerſed in them;

them; and may ſerve to explain the Effects of thoſe vitriolic Waters which are ſaid to convert Iron into *Copper*. A Piece of Iron Wire dipped into any of theſe Solutions, and taken almoſt immediately out again, is ſeen covered with *Copper* ſo far as the Menſtruum has touched it; and by drawing the Fingers carefully over it, a fine thin Tube of pure *Copper* may be taken off from it: This may ſerve to ſhew us of what Kind the Menſtruum is which Nature uſes to produce the blue Vitriol from *Copper*, which in Solution has the ſame Effect; and proves that the Ziment or vitriolic Water, ſo famous for its ſuppoſed Virtue, of turning Iron into *Copper*, is no other than a blue Vitriol in a fluid State, becauſe ſuſpended in too large a Quantity of aqueous Matter; perhaps, indeed, containing Particles of many other Kinds, but evidently owing its characteriſtic Quality, to Particles of *Copper*, in a State very nearly reſembling that of blue Vitriol, though at preſent in Solution.

That the natural Colour of Solutions of *Copper* in the vitriolic Acids is blue, is evident from only leaving a Drop of any of them on a Plate of *Copper*, which is preſently covered with blue Cryſtals: And any one a little acquainted with Chemiſtry will know, that no Difference is to be expected in Solutions made with Oil of Sulphur from thoſe with Oil of Vitriol; for theſe Acids differ ſcarce ſenſibly when both well rectified, and indeed appear, on ſtrict Examination, to be really the ſame Thing;

Thing; the ſame univerſal mineral Acid, exiſtent every where in the Earth, and ſometimes perceivable by the Senſes, in the ſuffocating Damps of Mines, being the certain Baſis of both; as alſo of a third, that of Alum: And though the different Matter it meets with in Alum, Vitriol, and Sulphur, gives it a different Appearance in the Concrete, yet when freed from that Matter by Chemiſtry, and rendered as pure as that Art will make it, it appears the ſame Thing, whether drawn from one or the other of theſe Subſtances.

That Oil of Vitriol, therefore, and Oil of Sulphur, ſhould produce a Solution of *Copper* of the ſame Colour, is no other than what muſt naturally be expected: But that *Aqua fortis*, which is a compound Menſtruum, and made, though partly from Vitriol, which affords a blue Solution, yet partly alſo from Nitre, which we have ſeen before affords a fine green one, ſhould give a ſimply blue Solution, as it evidently does, without the leaſt Admixture of Green, may ſeem, at firſt View, ſomething ſtrange. But here I muſt obſerve, that Spirit of Nitre is the Menſtruum I hinted at in the Beginning of this Letter, as capable of affording different Colours, from different Quantities of the Metal diſſolved in it. And nothing, indeed, is more certain, than that the greeneſt Solution of *Copper* in Spirit of Nitre, may be turned into a pale Blue, only by adding more and more Filings of the ſame Metal, up to the proper Quantity for the Change,

These,

Theſe, of all my Experiments on *Copper*, are what have afforded me the greateſt Satiſfaction in the Subject of the preſent Enquiry; as they ſhew, that Nature is ſo far from being tied to one ſingle Menſtruum for producing the *Sapphirine* Colour from *Copper*, that inſtead of the Colours of the blue Gems being owing only to the Effects of a ſingle, ſcarce, and indeed uncertain Menſtruum on that Metal, we find they are producible from the Action of others, and thoſe the moſt common, moſt abundant, and indeed, univerſal Menſtruums of the foſſile World. We need be no longer at a Loſs to find where Nature could meet with a ſufficient Quantity of a proper Menſtruum to extract from *Copper* the Colour neceſſary for the various blue Gems, when we ſee, that the univerſal native foſſile Acid, whether in Form of Vitriol, Sulphur, or Alum, and unqueſtionably not leſs when alone; and even the nitrous, under proper Limitations, are able abundantly to produce it.

Of the vegetable Acids, diſtilled Vinegar, Lemon-juice, and Spirit of Verdigreaſe, all give green Solutions of *Copper*; but with this Difference, that the firſt gives ſome faint Bluiſhneſs with the Green; the ſecond is a pale whitiſh Green; and the third, the true, pure, and unmixed Green of the *Emerald*.

The fermented vegetable Acids, therefore, have more Effect on this Metal than the native; this is evident from the deeper Colour, and from the much greater Quantity of the Metal ſeparable from Solutions with them, made in the ſame Proportions: And the Spirit of Verdigreaſe may very naturally excel both, as it is the ſtrongeſt vegetable Acid that Art can any way produce; though it is truly no other than a Vinegar abſorbed by *Copper*, and afterwards driven from it again by the Force of Fire; little altered, except as rendered more pure. It is remarkable, that *Copper* will thus part with this Acid in its proper and natural Form; whereas no other Metal will; for Iron and Lead, the only other Metals that will admit this Acid, alter it in the Mixture from its original Nature; for it can never be produced from them again in its natural State, but is in both Caſes quite a different Thing: When ſeparated from Lead, it appears in Form of an oily fat Liquor; and from Iron, little other than inſipid Water. The Spirit of Verdigreaſe is, however, the ſtrongeſt of all vegetable Acids; and accordingly, extracts from *Copper* the Colour neareſt approaching to that of the Solutions of that Metal in ſome of the ſtrongeſt mineral Acids.

Of the fixed Alkalies, Salt of Wormwood, Potaſhes, and Oil of Tartar *per deliquium*, all afford Solutions of *Copper* of a glorious, deep, celeſtial Blue, and no way diſtinguiſhable from one another, if the Solutions are made in exact Proportions. An *Ærugo*, of a greeniſh Colour, is indeed producible on *Copper* by theſe Menſtruums; and a ſmall Quantity of a ſimilar Subſtance is ſometimes found ſwimming on the Surface of theſe very Solutions: But this is not purely the genuine Effect of the Menſtruums, but a Change wrought in the Solutions made by them, by Particles of adventitious Salts floating in the Air; and mixing with a ſmall Quantity of them. Theſe Changes of Colour in the Solutions of *Copper* from an Admixture of Salts of a different Kind, tho' but in ſmall Quantities, we ſhall ſee hereafter in this Letter are very natural and eaſily producible Effects; and we need not wonder at a ſmall Quantity of an *Ærugo* of this Kind floating on the Surface of the Menſtruum, or affixed to a Plate of Copper wetted with it, and expoſed to the Air, tho' the true Solution of *Copper* in the Menſtruum is blue; when we conſider, that a Solution of the blue Vitriol in a Water impregnated with *Sal Armoniac* is green, notwithſtanding that a ſimple Solution of *Copper* in that Salt is blue; (ſuch is the endleſs Variety reſulting from Mixtures of Salts as Menſtruums) and that the natural *Ærugo* produced on *Copper* by the Salts floating in the Air, is green.

It is not to be wondered at, that the Solutions of *Copper* in the fixed Alkalies produced from different vegetable Subſtances, are no way different from one another, ſince theſe Bodies act in theſe Solutions, not as the peculiar Salts of this or that Plant, but as a Body made, not by any Operation of Nature, but by the Effect of Fire; which has ſtrongly united the eſſential Salt, the Earth, and ſome ſmall Portion of the Oil of the Vegetable they have been

been prepared from: For all theſe fixed Alkalies of Plants may be reſolved into a bitter ſaline Subſtance, a ſtronger fixed Alkali, and a pure ſimple Earth; and in the Operation there will a ſmall Quantity of an oily Matter always be diſcovered.

Of the volatile Alkalies, Spirit of *Sal Armoniac*, Spirit of Urine, and Spirit of Hartſhorn, all afford Solutions of *Copper* of the moſt beautiful and vivid celeſtial Blue: This is of different Degrees, according to the different Quantity of the Metal diſſolved; but in equal Proportions, and with the Spirits of equal Strength, the Colour is exactly the ſame in them all. The volatile Alkalies have in their Operations on this Metal, therefore, a great Analogy to the fixed. Theſe Menſtruums conſiſt only of a very fine, ſubtle, volatile, alkaline Salt, ſuſpended in a ſmall Quantity of Water, which has no Share in extracting this glorious Colour; for the dry volatile Salts of the ſame Subſtances, mixed with Copper Filings, and corked up in a Vial together, acquire, in a Day or two, the very ſame Colour.

Of the neutral Salts, a Solution of *Copper* with crude *Sal Armoniac*, is of a glorious Blue; with native *Borax*, of a fine deep Green; and with Sea-ſalt, of a pale whitiſh Green: Of theſe, the *Sal Armoniac* diſſolves it the ſooneſt, the Sea-ſalt takes more Time, and the *Borax* is ſloweſt of all. The reſt of the Solutions alſo mentioned here, require different Time and different Methods to produce them; the

Spirit of Nitre diſſolves the Metal almoſt inſtantaneouſly, *Aqua fortis* is nearly as quick in its Operation, and *Aqua regia* requires only a little Time: But of the others, ſome require long and tedious Proceſſes, and others act beſt, or perhaps only, by Vapour; and one of theſe Proceſſes ſhews, that where Mr. *Boyle* ſays, he knew a Menſtruum which by its Vapour would diſſolve a certain Metal, though it would ſcarce work on it at all in Subſtance; he is only talking of Copper and Vinegar. *Sal Armoniac*, it is to be alſo obſerved, affords us another Inſtance whence Nature may be ſupplied with a Menſtruum for giving a blue Solution of *Copper*; ſince, tho' the *Sal Armoniac* common among us now is factitious, there is no Queſtion but that there is, and ever has been, a true native *Sal Armoniac*; and there needs no more than *Copper* diſſolved in Water impregnated with it, to give the different Blues of all the deepeſt *Sapphires* in the World; it being moſt eaſy to procure a Solution of *Copper* of any Degree of Blue, only from a Solution of this Salt in Water, digeſted for a few Days on Filings of that Metal.

Nature therefore is not tied to one Menſtruum for the producing Blue from Copper; and that but a very ſcarce and uncertain one: Since it is evident, that the Bodies neceſſary to give it are many; and thoſe, many of them, common and every where abundant. That the common and univerſal mineral Acid, ſo abundant every where in all the Kinds of *Pyrites*, the

the Acid of Sulphur, Vitriol, or Alum; which are, indeed, the ſame with the former, and with each other, in different Combinations, can do it: And even no better a Menſtruum than common Water running over a Quantity of native *Sal Armoniac*, is able to produce from *Copper*, all the different Degrees of Blue, from that of the paleſt to that of deepeſt oriental *Sapphires*.

I am,

SIR,

Your humble Servant,

JOHN HILL.

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THEOPHRASTI LIBRO ΠΕΡΙ ΛΙΘΩΝ

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Ex Editione JOANNIS HILL, Eq. Aurat.

LONDINI 1774.

Prior Numerus Paginam, poſterior Lineam indicat.

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Zarnich *Aſfar*, n. — — — — 175
  Abmer, n. — — — ibid.
Ziment — — — — — 322

FINIS.

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